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ABSTRACT

This document is volume 4 of a four-volume report which describes the components of the Health Services Mobility Study (HSMS) method of task analysis, job ladder design, and curriculum development. Divided into three chapters, volume 4 is a manual for using HSMS task data and analysis results to develop curriculum objectives, guidelines, and educational ladders. Chapter 1 of this volume provides the conceptual framework of the HSMS method of curriculum design, presents several of its objectives, and a model describing the developmental processes of education. This chapter then describes the components of the HSMS curriculum design method, and the HSMS "curriculum guidelines." Chapter 2 is a manual for the preparation of curriculum outlines and curriculum objectives. Finally, chapter 3 discusses other components of HSMS curriculum guidelines and some applications. The appendixes contain the HSMS prototypes for curriculum objectives and examples of annotated task descriptions, curriculum outlines, and curriculum objectives. (The other three volumes of HSMS report no. 11 include the following: the HSMS skill and knowledge scales and knowledge classification system [volume 1]; a description of the work carried out by the director of a task analysis project and its job analysts [volume 2]; and a manual for using HSMS computer-based statistical procedures to design job structures and job ladders [volume 3].) (BM)

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THE HEALTH SERVICES MOBILITY STUDY METHOD OF TASK ANALYSIS AND CURRICULUM DESIGN

Research Report No. 11

Volume 4

DEVELOPING CURRICULUM OBJECTIVES FROM TASK DATA: A MANUAL

by
Eleanor Gilpatrick and Christina Gullion
Health Services Mobility Study

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ACKNOWLEDGEMENTS

This document is based on an earlier description of the HSMS curriculum design method which appears as Working Paper No. 11.[1] The method was simplified and applied in connection with HSMS work in radiologic technology; that application of the method is reported in Research Report No. 8, Volume 2.[2] This present document describes the revised HSMS curriculum design method.

The authors deeply appreciate the funds and time provided the Health Services Mobility Study (HSMS) over ten years of continuous funding. The major source of funding has been the Manpower Administration, now the Employment and Training Administration, of the U.S. Department of Labor (Contract No. 82-34-69-34). Our special thanks go to William Throckmorton, our Project Officer, who has been unstinting in his support.

HSMS originated in 1967 with the Office of Health Affairs of the Office of Economic Opportunity (Grant No. CG 8783). Other funding has come from the Health Services and Mental Health Administration (Contract No. 110-69-256) and a Memorandum of Agreement with the Division of Allied Health Manpower, Bureau of Health Manpower Education, Department of Health, Education and Welfare. We also received funds to assist with the completion of the work from the Bureau of Radiologic Technology, New York State Department of Health.

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Irene Seifer provided editorial review; and Richard Preston did the typing. It would be impossible to fully acknowledge all the other people who were involved in earlier stages of the work. We thank everyone for their help and support. Any errors are solely the responsibility of the Health Services Mobility Study and the authors.

Eleanor Gilpatrick
Christina Gullion

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[1] Christina Gullion and Eleanor Gilpatrick, The Design of Curriculum Guidelines For Educational Ladders Using Task Data, Working Paper No. 11, New York: Health Services Mobility Study, July, 1973.

[2] Eleanor Gilpatrick and Christina Gullion, Using Task Data In Diagnostic Radiology, Research Report No. 8, Volume 2, "Curriculum Objectives For Radiologic Technology," New York: Health Services Mobility Study, 1977.

PREFACE

In September of 1967, Eleanor Gilpatrick became the director of the Health Services Mobility Study, a project funded by the Office of Economic Opportunity. The grant carried the charge that the project investigate the impediments to upward mobility in New York City Municipal Hospitals and that it suggest means of overcoming obstacles to such mobility. It was a one-year grant.

Ten years later, the Health Services Mobility Study (HSMS) is ending its research and development activities. During that time, HSMS examined the occupational structure of New York City Municipal Hospitals and investigated the problems of skill shortages and credentialing.[1] It then undertook to design a method to promote occupational mobility by tying job requirements to curriculum design in a single system.

HSMS developed, field tested, and applied a new task analysis method to analyze work and design job ladders. It produced a method of curriculum design using task data that also makes it possible to design educational ladders to parallel job ladders. The HSMS method can be used to make job structures and curricula responsive to quality standards and the needs of consumers.

HSMS has made theoretical contributions to the fields of job analysis, curriculum development, and occupational testing. It has helped to promote the concepts of upward occupational and educational mobility, and has developed a design for a safe practice, quality assurance program in diagnostic radiology.

The HSMS method was pilot-tested in an ambulatory care community health center. It was given a full-scale application in diagnostic radiology. An abbreviated version of the method was applied to the technologist, technician and aide functions in radiation therapy and diagnostic ultrasound. A curriculum has been developed covering the aide, technician, and technologist levels in diagnostic radiology.

Although these applications have been in health service occupations, all of the components of the method are generic and can be applied to any work activity in any industry.

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[1] Eleanor Gilpatrick and Paul Corliss, The Occupational Structure of New York City Municipal Hospitals, New York: Health Services Mobility Study and/or Praeger Publishers (Research Report No. 2), 1970.

Now the time has come to share the method so that it can be used by others. This research report offers all the components of the HSMS method of task analysis, job ladder design, and curriculum development for use as a system or in part. It is offered to any institution that wishes to expend time and resources to rationally structure work, utilize its labor force, evaluate its work performance, develop job ladders, design job-related education, or create work-related test instruments. This material is reported as follows:

Research Rpt. No. 11	THE HEALTH SERVICES MOBILITY STUDY METHOD OF TASK ANALYSIS AND CURRICULUM DESIGN.
Vol. 1	Basic Tools: The Concepts, Task Identification, Skill Scales and Knowledge System.
Vol. 2	Writing Task Descriptions and Scaling Tasks for Skills and Knowledge: A Manual. (Also contains an abbreviated version of the task description method.)
Vol. 3	Using the Computer to Develop Job Ladders. (Includes technical material, computer programs, scholarly review, and a mini-manual for performance evaluation.)
Vol. 4	Developing Curriculum Objectives from Task Data: A Manual.

The reader is directed to other HSMS documents for additional information not contained in Research Report No. 11 as follows:

Technical Rpt. No. 11	HEALTH SERVICES MOBILITY STUDY: FINAL REPORT FOR THE PERIOD OCTOBER 1967 THROUGH MARCH 1972. (Contains a review of the literature in task analysis and the derivation of the HSMS task analysis method.)
Working Paper No. 11	THE DESIGN OF CURRICULUM GUIDELINES FOR EDUCATIONAL LADDERS USING TASK DATA. (Earlier version of the HSMS curriculum design method. Contains a review of the literature in occupational curriculum design and behavioral objectives, and other related material not presented in Research Report No. 11, Vol. 4.)

Research Rpt. No. 7	TASK DESCRIPTIONS IN DIAGNOSTIC RADIOLOGY.
Vol. 1	Medical Tasks: What the Radiologist Does.
Vol. 2	Radiologic Technologist Tasks Dealing With Patient Procedures.
Vol. 3	Machine-Related, Patient Care and Administrative Tasks: What Radiologists, Technologists, Nurses, and Physicists Do To Run Things and Look After Patients and Equipment.
Vol. 4	Index of Tasks by Code Number and Extended Name.
Research Rpt. No. 8	USING TASK DATA IN DIAGNOSTIC RADIOLOGY.
Vol. 1	Job Ladders: Assigning Tasks to Jobs.
Vol. 2	Curriculum Objectives for Radiologic Technology.
Research Rpt. No. 9	THE TECHNOLOGIST FUNCTION IN FIELDS RELATED TO RADIOLOGY: TASKS IN RADIATION THERAPY AND DIAGNOSTIC ULTRASOUND.
Research Rpt. No. 10	RELATING TECHNOLOGIST TASKS IN DIAGNOSTIC RADIOLOGY, ULTRASOUND AND RADIATION THERAPY.
Working Paper No. 12	USING TASK DATA FOR PERFORMANCE EVALUATION AND PROFICIENCY TESTING. (tentative title)
	(Theory of criterion-referenced and norm-referenced testing; use of task data as inputs to testing. The HSMS theoretical document on occupational proficiency tests and issues of validity.)

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CHAPTER 1

HSMS CURRICULUM DESIGN: CONCEPTS

INTRODUCTION

This fourth volume of Research Report No. 11 presents the Health Services Mobility Study (HSMS) curriculum design method. It is a manual for using HSMS task data and analysis results to develop curriculum objectives, guidelines, and educational ladders.

The four volumes of this report present the entire HSMS task analysis and curriculum design system. Volume 1 contains the HSMS skill and knowledge scales and the HSMS Knowledge Classification System. It is the companion document to Volume 2, which describes the work carried out by the director and job analysts in a task analysis project; it covers task identification, task description, skill scaling, and knowledge identification and scaling. Volume 3 describes how the HSMS computer-based statistical procedures are used to design job structures and job ladders; it contains the HSMS computer programs and a manual for their use to group tasks, to arrange tasks into jobs and job ladders; it also describes how to use the data and analytic results for performance evaluation and manpower planning.

ABOUT VOLUME 4

Chapter 1 of this volume provides the conceptual framework of the HSMS method of curriculum design, presents several of its objectives, and a model describing the developmental processes of education.

We then describe the components of the HSMS curriculum design method, and the HSMS "curriculum guidelines."

Chapter 2 is a manual for the preparation of curriculum outlines and curriculum objectives. Chapter 3 discusses other components of HSMS curriculum guidelines and some applications.

Appendix A provides the HSMS prototypes for curriculum objectives which the reader can use in the preparation of his own curriculum objectives. Appendixes B, C and D present examples of annotated task descriptions, curriculum outlines and curriculum objectives.

OCCUPATIONAL PREPARATION AND HSMS GOALS

The HSMS method of curriculum design was originally developed [1] as part of a system of analysis to help promote occupational mobility and to help solve the problem of skilled labor shortages. The system can be used to minimize the education time needed in preparing individuals for work. The underlying purpose is to have educational sequences which parallel job ladder sequences; this would make it possible to identify and eliminate needless repetition of course work. In order to have such sequences the content of curricula must be both academic (conceptual) and job relevant. As HSMS began to develop task

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[1] In 1973, Christina Gullion and Eleanor Gilpatrick developed the HSMS curriculum design method. Working paper No. 11 reports the theoretical underpinnings of the method as it was first developed, along with a review of the literature in the field and a discussion of the problems involved in instituting new curricula.

Christina Gullion and Eleanor Gilpatrick, The Design of Curriculum Guidelines for Educational Ladders Using Task Data, Working Paper No. 11, New York: Health Services Mobility Study, July, 1973.

descriptions which describe work as it should be done, an additional objective was added: to design curricula that incorporate and help ensure desirable work practices.

Education and Training

Narrow technical training is offered for most entry-level jobs, and is the form in which preparation for many emerging specialties first appears. Such training teaches students what to do in an immediate job context and under the specific conditions of a given institution or piece of equipment. This type of "training" is generally designed to provide rapid results; the student performer learns to carry out routine procedures by rote.[2]

While "training" is related to work performance, it may be inadequate for use in connection with job ladders which lead to professional levels. Training for the rote performance of narrowly conceived task procedures does not prepare the student to deal with contingencies and emergencies that may arise. The student does not learn why he or she is carrying out a given procedure or what principles are involved. Thus, the student does not learn enough to be able to function responsibly, and is not prepared for the conceptual groundwork upon which later learning for higher-level tasks must be based. The rote learning is not additive and, therefore, is not transferable vertically.

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[2] We do not mean to equate the experience of clinical practice with technical "training." Clinical practice can be consciously designed to promote educational objectives.

Learning to perform by rote is also not transferable laterally. It does not prepare the student to apply knowledge in a different work situation where, if the principles were understood, the same learning would apply, or to a different set of materials or equipment where, if the reasons were understood, the same procedures would apply.

In addition, "training" does not provide the student with transferable academic credits when it is not academically based or is provided in a terminal, technical program. Thus, the time spent in training is wasted if the student aspires to upward job mobility which requires the accumulation of academic credits.

"Education" usually means conceptually based preparation, covering the content assumed to be absent from "training" as the term is being used here. Education is usually associated with academic, degree-granting programs. Occupational preparation in degree-granting programs usually stresses the disciplines upon which technical work is based. This appears to provide implicitly for transferability of learning as well as accumulation of credits. However, academic programs can be found to require obsolete or irrelevant course work; they are sometimes taught in a manner far removed from the work contexts to which they should refer, and they are sometimes lacking in training in important subject areas related to new developments in a field. Thus, educational programs are not necessarily useful preparation for work. Many programs require more relevant content and need to provide appropriate clinical experiences to be truly job related.

The HSMS curriculum development method is designed to provide occupational preparation that assures transferability of training and job relevance. This makes it possible to design educational ladders to parallel job ladders.

Educational Ladders

Job ladders in health services and in several other fields cannot be implemented without the existence of educational ladders. This is true when higher-level jobs are reachable only through attainment of degrees, licensure, or other credential requirements. Unfortunately, curricula for many health occupations are educationally terminal. They are concerned with preparation for a given occupation at a given academic level without regard to past or future preparation. Movement from one job level to another requires "starting from scratch" in each program regardless of prior training, with the burden resting on the student to obtain the needed credentials.

An educational ladder would alleviate this problem. It would offer a related, sequential set of educational courses or programs that would make possible continuous educational movement to parallel the movement along a job ladder from an entry-level job to higher-level jobs. Exit credentials would be provided where appropriate for each intermediary job reached at the end of each program in the sequence. This would make it possible for individuals to exit from the educational process and take jobs for which they are prepared, and at a later date to reenter the educational process in order to

continue up a job ladder. Such sequencing would not require repetition of course work and would provide for accumulation of credits.

For such upward mobility to be possible, the student must be able to build on his or her knowledge and skills in cumulative steps. The HSMS task analysis and curriculum design method assumes that a deep, broad understanding of a given knowledge area can be reached in successive, incremental steps, and that skills can also be learned in incremental steps. The concept that skills and knowledges are teachable incrementally is expressed in the HSMS skill and knowledge scales; the use of scaling makes it possible to design job ladders and educational ladders.

The HSMS method results in curriculum units referred to as "curriculum objectives." These specify the work activities which a student must be able to master after appropriate preparation. (In contrast, instructional objectives specify the classroom activities which a student must be able to master.) The HSMS curriculum objectives reflect the goals described earlier; they provide for upward mobility and excellence of performance:

1. The HSMS curriculum objectives utilize the language of HSMS task descriptions. This provides for job relevant educational preparation.

2. The HSMS curriculum objectives place curriculum content in the context of formal disciplines. This makes it possible to connect task content with underlying principles and concepts, and helps to make learning transferable, both laterally to new work situations and vertically to the next occupational-educational level.

3. The HSMS curriculum objectives are designed to make it possible to identify overlapping areas of content in different educational programs and to account for successive levels of content in a given subject area. This helps to identify and eliminate curriculum redundancies when individuals move up in an educational sequence (ladder).

EDUCATIONAL PROCESSES AND OCCUPATIONAL PREPARATION

The HSMS contribution to the educational process is primarily in the area of curriculum development. However, our earlier review of the literature suggested that to put the function of curriculum development into perspective it is necessary to differentiate among the other stages in a system of developmental processes in education.

In our earlier work we were able to conceptually identify five stages of development. The elaboration of input-output components at each stage makes the relationships among the stages clear. One of the characteristics of a "stage" is that it results in outputs which become inputs to the next stage. However, since they are not the sole inputs to the next stage, they constrain but do not determine the outputs of the next stage.

Figure 1 presents the five-stage model developed by the authors. It elaborates on a three-stage model originally presented by Mauritz M. Johnson, Jr.[3]

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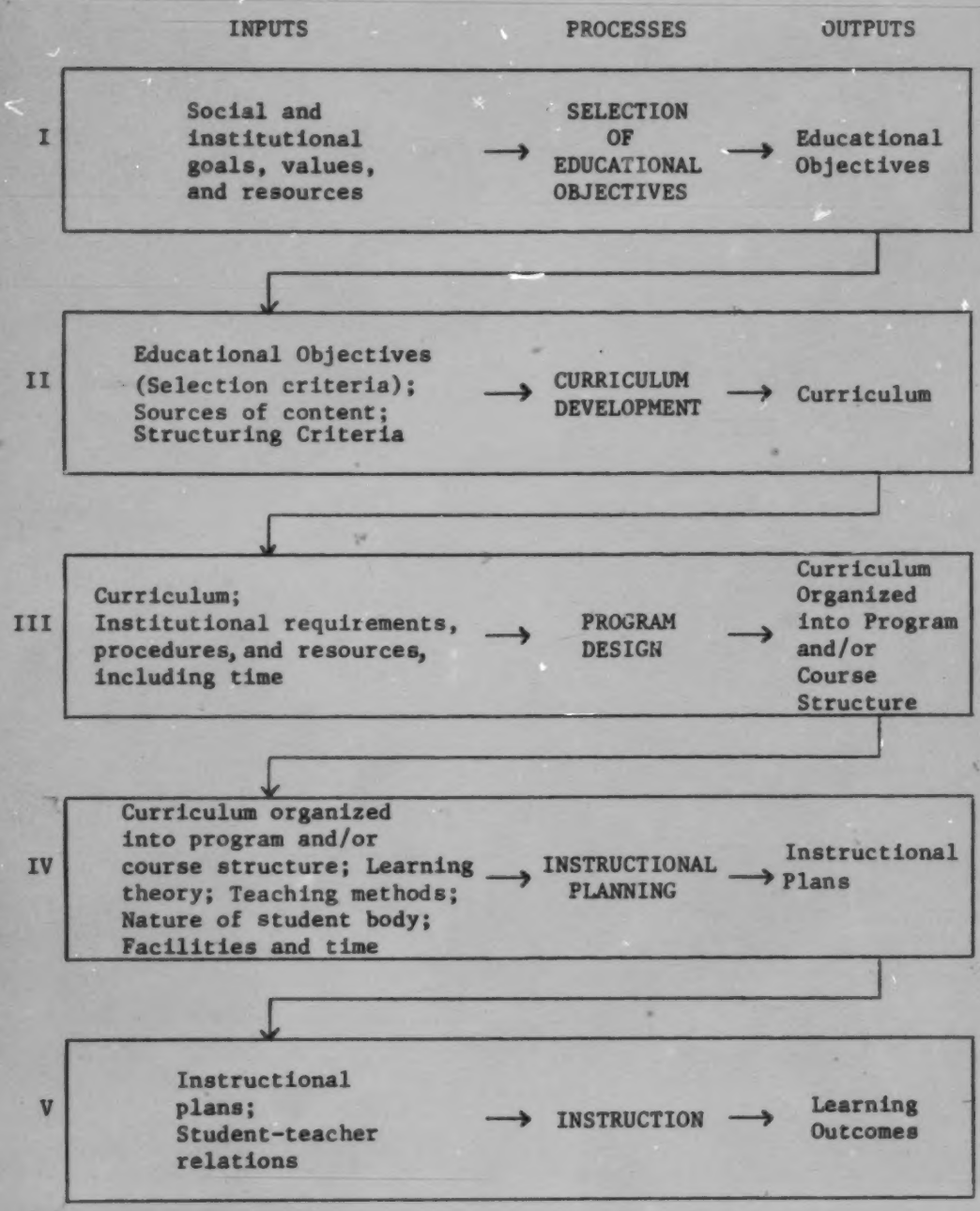
[3] Mauritz M. Johnson, Jr., "Definitions and Models in Curriculum Theory," in Educational Theory, Vol. 17, April, 1967, pp. 127-140.

Figure 1. A MODEL OF EDUCATIONAL PROCESSES AND OUTPUTS



The first stage of our model of the developmental process in education is selection of educational objectives. At this stage the educational institution decides what it will teach and what goals and values it will try to achieve. The second stage is curriculum development, in which curriculum content is selected and structured. The educational objectives are inputs to this process, and the output is the curriculum. The third stage is program design, in which the curriculum is arranged into sequences and courses to fit the needs of the institution's program and time requirements; academic credits are assigned at this stage. The curriculum is the major input to program design, but the institutional framework is also an important input.

The fourth stage is instructional planning. At this stage the teacher takes the "intended learning outcomes" of the curriculum arranged into programs and courses and devises sequences of instruction. The instructor adds additional content to facilitate learning, selects instructional units and materials, and plans presentations. The fifth stage is instruction, in which students and teacher interact within the teaching environment; the outputs are learning outcomes which achieve the objectives of the prior stages to one degree or another.

One can add an evaluation component to each stage. Learning outcomes may or may not correspond to educational, curriculum, or instructional objectives. Evaluation at each stage in terms of the objectives of the prior stage turns the model into an educational system.

Selection of Educational Objectives

The first stage in the development of an educational system is the selection of educational objectives. This stage helps determine the content of a curriculum, since the purposes of a curriculum are determined here. The objectives may lead to the development of curricula to train students for occupations, to obtain academic degrees, or to meet external requirements for licensure or accreditation. The objectives may also relate to content such as social values of one sort of another, quality standards for occupational performance, and ethical choices. The decision to have educational ladders is also the selection of an educational objective.

HSMS chose to become associated with a specific set of educational objectives. These include a commitment to occupational preparation, particularly for health occupations. We chose to prepare curricula in the form of educational ladders which, in turn, meant opting for curricula which combine both training and education. We undertook the writing of normative task descriptions in order to fulfill the objectives of having curricula emphasize high quality performance and patient safety.

Curriculum Development

The second stage in the development of the educational process is curriculum development. This stage includes two activities. The first is selection of curriculum content from available sources; the second is structuring the selected content. Educational objec-

tives are one of the inputs to curriculum development and determine the criteria for the selection of content.

The content selected by HSMS is the behavior represented in the task descriptions, the disciplines of the Knowledge Classification System, and the HSMS skills. The structuring criteria are partly determined by the HSMS analysis, which arranges tasks into factors by virtue of their skill and knowledge requirements, and the inherent relationship among the disciplines as manifested in the skill and knowledge factors obtained. The association of disciplines in a given occupation determines the HSMS factor results.

The units of curriculum are curriculum objectives, i.e., statements of intended learning outcomes. Johnson defines a curriculum as "a structured set of intended learning outcomes." HSMS organizes its curriculum objectives and presents them in curriculum outlines. These curriculum outlines are recommendations for educational sequences and are inputs to program design, the next stage.

Program Design

The third stage is program design. It is the division and arrangement of a curriculum into sequences and/or units appropriate to content, time requirements, and the structure of the educational institution. Program design is done within a specific institutional setting, sometimes by an administrative office, sometimes by a committee of the faculty, and rarely by the individual teacher, who is usually concerned with instructional planning for a given course.

The program designer must take into consideration the facilities and faculty available to carry out a program as well as the accreditation requirements which may govern credit hour distributions for various content areas. He or she may combine or separate areas of content into courses or sequences. The program designer takes admission requirements into account, and may plan introductory, remedial, or "enabling" courses which prepare students to deal with the material specified in the curriculum.

The program designer must also take into account the way in which learning experiences are organized at the institution. One institution may require a modular curriculum in which content is organized and taught in short sections, using pre- and post-tests of competencies to determine individual student progress. Another institution may require a traditional credit-hour semester; still another may provide bilingual education for an ethnically mixed student body. Institutionally determined conditions such as academic credits, degrees, certification, or other "milestone" divisions of content set the framework within which programs are designed. All these institutional arrangements have implications for the way in which curriculum content is organized into a program.

Instructional Planning

The fourth stage is instructional planning. Instruction is planned around the needs and interests of the students and teacher, in the context of the classroom or clinical setting, and within the constraints imposed by the curriculum. The "intended learning outcomes"

which have been selected for the given area of instruction during program design are taken as goals or parameters. The teacher uses his or her knowledge of learning theory and teaching methods to select additional content to facilitate learning, to devise sequences of learning, to select instructional units and materials, and to plan presentations. Facilities, available time, and the nature of the student body provide additional inputs and constraints. The outputs are lesson plans.

Instruction

Stage five is instruction. It is an interaction of the students and the teacher within the teaching environment. It is the culmination of the prior stages; i.e., the application of the instructional plan and its attendant materials in the classroom or clinical setting. Its outputs are the learning outcomes. As in other stages, the outputs are not predetermined, since they are mediated by the interactions of the teacher and the students.

Evaluation

The output of a given stage may or may not correspond to the objectives of the prior stage. Curriculum objectives may not be appropriate for a given set of educational objectives; instructional objectives may not reflect curriculum objectives; and learning outcomes may not correspond to instructional objectives. Evaluation investigates whether actual outcomes correspond with intended outcomes. The evaluation of each stage in terms of the objectives of the prior stage, and the resulting feedback, turn the five-stage model into an educational system.

HSMS CURRICULUM GUIDELINES

The HSMS method of task analysis and curriculum design results in materials for most of the stages of the developmental processes in education. The HSMS task data and analytic techniques make it possible to develop and specify a set of educational objectives including the "desiderata" for occupational performance. We are able to provide curriculum outlines to parallel job structures and job ladders; the outlines are the structured set of intended learning outcomes.

The curriculum units produced during the curriculum development stage are behaviorally stated curriculum objectives which use task language to indicate the way in which academic disciplines and skills are to be applied. We are able to produce curriculum units usable in program development, and can offer suggestions for instructional planning. The task descriptions are offered as instructional materials. This total contribution to education in an occupational area is what we call curriculum guidelines. The curriculum guidelines are intended for use by program developers and instructors who will use them in program design and instructional planning.

Educational Objectives

The selection of the occupational area for study, the decision on what tasks to include, and the inclusion of performance "desiderata" in the task descriptions are all HSMS inputs to the selection of educational objectives. The option to make job ladders possible through the design of educational ladders is expressed in the HSMS curriculum outlines.

Curriculum Outlines

HSMS curriculum outlines are a structured set of curriculum objectives referenced to the job structures which emerge after factor analysis. The tasks assigned to each job level within a factor are the occupational-educational units for which curricula are designed. The curriculum outline for any given occupational-educational unit lists each skill and each knowledge category required by any of the tasks in the unit, with a separate listing for each scale value required. The tasks which require the skill or knowledge category at a given scale value are also shown. They are the reference units for the preparation of curriculum objectives. The units to which the curriculum objectives refer are arranged in the curriculum outlines in educational sequences. The outlines make it possible to plan sequences so that much of the material required for higher-level occupational-educational units can be covered at one or another lower level or can be anticipated in the instructional planning at lower levels. Thus, the curriculum outlines make it possible to do long-range curriculum planning and to design educational ladders.

Curriculum Development

The HSMS method offers a basis for selection of curriculum content by virtue of its educational objectives, the task descriptions, and the skill and knowledge categories. The HSMS method also provides a basis for the structuring of curriculum content. This is done by virtue of the way in which the Knowledge Classification System is

structured, by virtue of the use of scales for skills and knowledge, and by virtue of our use of factor analysis, which permits us to relate tasks in terms of skill and knowledge relationships, to arrange these in hierarchical groupings, and to assign tasks to job levels.

The HSMS curriculum unit is determined by task data and statistical analysis. All the tasks assigned to a given task factor at a given job level are the reference for a given occupational-educational unit. The units of curriculum are curriculum objectives. Each is stated as an intended learning outcome in the language of the task descriptions. The HSMS curriculum objectives are written as behavioral objectives, and describe the content which must be mastered and the behavior that is to be manifested. A curriculum objective is written for every skill and every knowledge category at each scale value required for the tasks covered by an occupational-educational unit.

The HSMS curriculum objectives are written in the form of traditional "behavioral objectives" and include the behavior, the conditions, and the criteria for performance within a statement of the appropriate content to be learned.

There are three types of objectives: skill, knowledge, and procedural. The skill and knowledge objectives state in detail the content which must be learned in order to perform the tasks. They specify the type of skill or the area of knowledge to be learned, the level of competence, and the task activities in which the content must be demonstrated or applied. By presenting the work behavior in

combination with the skill or knowledge discipline in the curriculum objectives, the method assures job relevance and an academic context, and focuses on the desired end product. The procedural objectives cover the sequences in which the tasks must be performed.

Program Design

The HSMS curricula are designed for use in educational ladders. Each curriculum objective states an "intended learning outcome" consisting of a distinct combination of content and activity which reflects the tasks in the occupational-educational unit to which it refers. Although we recommend the structuring of particular curriculum content, the demarcation between programs, and the sequencing of content within programs, the occupational-educational units and their curriculum objectives are sufficiently discrete for program designers to combine or separate them for given skills and knowledges as appropriate to their needs; the curriculum objectives can be moved from one program to another.

Instructional Planning and Instruction

While it is possible for the HSMS method to provide curriculum development without requiring a staff that is competent to do instructional planning, the nature of the data and results make it possible to offer suggestions for instruction. Not only are the task descriptions appropriate for instructional use as descriptions of what clinical practice should be, but the associations of skills and knowledges in factors and the nature of the skill scales also provide information on appropriate assocations of subject matter and sequencing of curriculum content within a course or program.

EVALUATION

After instruction has taken place, actual learning outcomes may or may not correspond to instructional objectives; even if the instructional objectives have been met, these may not correspond to the intended learning outcomes of the curriculum objectives; there is always the possibility that mastery of the curriculum objectives does not produce the hoped-for performance on the job that is expressed in educational objectives. Evaluation at each stage in the process makes it possible to revise the work at that stage to achieve the objectives of the prior stage.

The HSMS curriculum objectives are behavioral statements that describe work activities, describe the conditions under which the activities are to be demonstrated, and include reference to the skills or knowledges to be utilized in the activities. If one further step is taken, the curriculum objectives can be transformed into evaluation instruments. That step is the provision of competency standards for each curriculum objective. Once the competency standards are known, students can be rated; the result would be criterion-referenced evaluation instruments.

The standards for the curriculum objectives could be determined by the instructor, program designer, or a team of experts. The result would be provision of competency-based education, wherein the competency is referenced to the ultimate job application rather than to the classroom.

Competency-based education, which usually means individualized instruction, makes it possible to eliminate formal time requirements. The conventional use of a fixed amount of time which must be spent in approved or accredited programs before the individual may enter into an occupation (or sit for a licensure or certification examination) makes the implicit assumption that time equals adequacy of preparation. But the arbitrary assignment of time requirements is no guarantee that students will be adequately trained; the increase of time requirements sometimes suggested for programs is no guarantee that student performance will be improved. It is more important to make sure that curriculum requirements reflect task requirements and meet educational objectives.

This approach to evaluation could also be used to determine student readiness to pass from laboratory to clinical work, or to ascertain when clinical work is successfully completed. The result of such evaluation might be greater safety for the patients who are involved in clinical practice.

In many health services occupations, passing licensure and/or registration examinations, and/or successful completion of occupational programs are prerequisites for employment. Examinations are therefore an important form of evaluation, telling the graduate whether he or she has mastered the credential requirements for an occupation (whether or not these correspond to the needs of the job).

The HSMS methods of task analysis and curriculum design and the HSMS curriculum objectives provide the objectivity, logic, and

focus needed for the selection of test content. The use of curriculum objectives as the source of test items provides job-related content validity, because these objectives are taken directly from task language and completely bypass classroom behaviors. They provide professional standards because they are based on normative task descriptions which have been reviewed by leaders in the occupation. The experts thus provide inputs to the area where they have expertise.

An HSMS behavioral curriculum objective defines the universe of content from which one can generate test items that measure competence in a particular work-related skill or knowledge at a level of difficulty determined by the nature of the task activity. Information included with each curriculum objective indicates the number of tasks for which the skill or knowledge at a given scale value is relevant. Thus, frequency across all the tasks of an occupation is known and can be used as a reference for weighting or to determine the centrality of the content.

CHAPTER 2

PREPARATION OF CURRICULUM OUTLINES AND BEHAVIORAL CURRICULUM OBJECTIVES: A MANUAL

INTRODUCTION

This chapter is a manual for curriculum design. It assumes that the curriculum designer has access to task descriptions based on HSMS methodology, skill and knowledge data for each of the tasks to be reflected in the curriculum, and the results of the statistical analysis which has assigned the tasks to factors and job levels.[1]

The HSMS task descriptions and skill and knowledge data are the basis for determining the curriculum content of occupational programs. Once the tasks are grouped by factor and job level and are arranged into occupational-educational units (job structures), it is possible to state curriculum requirements, write curriculum objectives, and design curriculum sequences. This chapter tells how.

In carrying out curriculum design it is most efficient to begin by developing a curriculum outline for each occupational-educational unit to be covered. This makes it possible to list each of the curriculum objectives that must be written. If an educational ladder is to be designed, curriculum outlines showing the sequence of skill and knowledge requirements make it possible to plan curriculum objectives for skills and knowledges which take account of the requirements in other occupational-educational units. Another major

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[1] This means that the steps described in Volumes 2 and 3 of this report have been carried out.

function of curriculum outlines is to serve as indexes and as a basis for ordering the curriculum objectives.

The sequence of events for curriculum development (design) includes the following:

1. Preparation of task data for curriculum development.
2. Preparation of curriculum outlines using MATRIX (computer output) arrays.
3. Preparation of forms for writing curriculum objectives.
4. Writing curriculum objectives.

STAFF FOR CURRICULUM DEVELOPMENT

At HSMS the director and a senior staff member prepared curriculum outlines and wrote and edited the curriculum objectives. HSMS job analysts prepared annotation sheets during their skill and knowledge scaling since they were best able to use the task descriptions to indicate which task description elements they were referring to when they scaled a task for a given skill or knowledge category. The senior HSMS staff member was trained in the HSMS task analysis method, including the skill scales and the Knowledge Classification System, and was assigned the job of final review of the skill and knowledge scale data. Thus, she was intimately involved with the content of the task data and able to carry out the work in curriculum development.

If the curriculum development function is carried out by an institution that was not part of the prior task analysis phase of the work and it does not have access to annotated task descriptions, then a team of curriculum analysts must be trained in the HSMS scaling

methods as described in Volumes 1 and 2 of this report. The team would have to prepare annotation sheets using task descriptions and scaling data as described later in this chapter and in Research Report No. 10. [2]

The HSMS curriculum development method does not require the staff to be health services practitioners or educators. The director and senior staff member in charge of curriculum development must have strong conceptual, analytic, and taxonomic skills, with a high degree of devotion to details. It is important that one or both of these people be trained in and/or involved with the writing or editing of the task descriptions, review of the scaling, and the computer-based analysis.

While it is not necessary for the curriculum analyst to be a job analyst, a full grasp of the method and exposure to a field's specialized literature used during the task description phase is essential. The curriculum analyst should also be familiar with the educational objectives ("desiderata") which are incorporated into the task descriptions and are to be reflected in the curriculum objectives.

The task of writing curriculum objectives requires the ability to recognize and synthesize the technical content in task descriptions, the ability to write clearly, and a willingness to follow the rigorous prescriptions of the method.

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[2] Eleanor Gilpatrick, Relating Technologist Tasks in Diagnostic Radiology, Ultrasound and Radiation Therapy, Research Report No. 10, New York: Health Services Mobility Study, 1977.

For Research Report No. 8 [3] a senior HSMS staff member prepared the initial drafts of the curriculum objectives. The HSMS director translated the factor analysis data into curriculum outlines and edited the curriculum objectives. The relevant job analysts and task description reviewers were consulted when there were ambiguities in task description language, when the content of knowledge categories was unclear, or when it was difficult to comprehend how a given category was used in a given task activity. We also consulted the relevant literature.

PREPARATION OF TASK DATA FOR CURRICULUM DEVELOPMENT

The HSMS curriculum development method has been simplified since its initial formulation in Working Paper No. 11. Most of the preparatory work, which requires the identification of the task description language that embodies the skill and knowledge scaling, is carried out by the job analysts during the period of skill and knowledge scaling. The HSMS curriculum analysts then review the work. As a result, the curriculum analysts' prime function is to consolidate the task language for use in curriculum objectives based on the results of the statistical analysis.

Task Description Annotation Sheets

During skill and knowledge scaling the job analysts scale each task for the highest scale value required in each skill and/or

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[3] Eleanor Gilpatrick and Christina Gullion, Using Task Data in Diagnostic Radiology, Research Report No. 8, Volume 2, "Curriculum Objectives for Radiologic Technology," New York: Health Services Mobility Study, 1977.

knowledge category needed to perform each task. The job analysts are then required to mark or indicate the part or parts of each task description in which each skill or knowledge is applied or manifested at the scale value selected. These are called task description annotation sheets. Appendix B presents examples of the annotation sheets.

The job analysts work with two separate sets of annotation sheets; one for skills and one for knowledge. The skill scale values appear on Skill Scaling Sheets, and the knowledge categories and scale values appear on Knowledge Identification Sheets. During the skill scaling period each final Skill Scaling Sheet is stapled to its annotated task description and is turned over to the staff who do the data review. Similarly, the final Knowledge Identification Sheets are stapled to each task's annotation sheets and are turned over for review. After the review is completed, these sets of scale values and annotation sheets become the raw materials with which the curriculum analysts work.

If the user has access only to final task descriptions and skill and knowledge scale data, annotation sheets can be prepared at the curriculum design stage. Appendix B offers examples of annotation sheets for five tasks. Volumes 1 and 2 of this report should be studied by the curriculum development staff so that they can understand how to use the skill scales and the Knowledge Classification System and scale. The following are general instructions for preparing annotation sheets:

1. Copies of final Task Descriptions or Task Summary Sheets are divided in half vertically, by columns, and are glued on blank sheets or photocopied so that one column appears on one side of the sheets and a blank margin appears on the other half.

   a. Each resulting annotation sheet should contain the Task Code No., the page number of the task, and the number of pages for the task.

   b. Two sets are prepared; one for skill scaling and one for knowledge identification and scaling. The analyst works first with skill scaling and then with knowledge identification and scaling.

2. In skill scaling, the job analysts have scaled each task for the highest scale value of each skill needed to perform each task.

   a. The analyst now finds the elements or instances of each task description or task summary that call for the highest level of the skill being considered. This determined the task's scale value for that skill. The analyst consults the scale point descriptors as an aid. (See Volumes 1 and 2 of this report.) When these have been found and marked, the analyst enters the name of the skill scale and the scale value next to each marked section on the annotation sheets. He or she checks that the scale value corresponds with the value circled on the Skill Scaling Sheet (see Appendix B).

   b. For certain skills, such as Decision Making on Quality, a comment may need to be written to explain how the skill is manifested, since it can be implicit rather than explicit in the language of the task. (See Figures B.4 and B.10 in Appendix B).

   c. Where several elements in a task draw on the same skill, the one drawing on the highest level is the one to be marked and receive the scale value. If more than one element requires the skill at the same (highest) scale value, all should be marked with the name and value on the annotation sheets.

   d. The analyst may note that a given element in a task requires more than one skill; he or she should annotate the element for as many skills as are represented.

3. In knowledge identification and scaling the job analysts have identified each knowledge category needed to perform each task and the highest scale value at which each is needed on the knowledge scale. The analyst now finds and marks or indicates the part or parts of each task description or summary in which each knowledge category is applied or manifested.

   a. The analyst finds each knowledge category and scale value indicated on the Knowledge Identification Sheets and works with the second set of annotation sheets. For knowledge identification and scaling the analyst should be familiar with the Knowledge Classification System and scale (Volumes 1 and 2 of this report).

   b. In the case of knowledge categories, a task's scale value for the category depends on the amount or breadth of detailed knowledge needed as well as the depth of understanding required. Therefore, if several elements in a task draw on the same knowledge category, <u>all</u> should be indicated on the annotation sheets, especially if they refer to different areas of the subject matter covered by the category. This determines the breadth of knowledge for the scale value.

   c. The depth of understanding indicated by the scale value may be required by only one or two elements. The analyst enters the scale value next to those elements on the annotation sheets. This step may be eliminated. If it is carried out, the total breadth of detailed knowledge required for each category now has a series of annotated referents, with those reflecting the deepest level of understanding assigned the scale value.

   d. The analyst checks that the category name and scale value correspond with those on the Knowledge Identification Sheets. If several elements draw on the category at the scale value, all are given the value on the annotation sheets. (See Appendix B.)

   e. A given element in a task may require more than one knowledge category. The analyst annotates the element for as many categories as are represented.

4. The analyst should check both sets of annotation sheets to make sure that every scale value above zero for each skill scale and each knowledge category identified has a referent marked and scaled on its task description annotation sheets. As a further check, the analyst should be sure that when the same language appears in several tasks, it is always annotated the same.

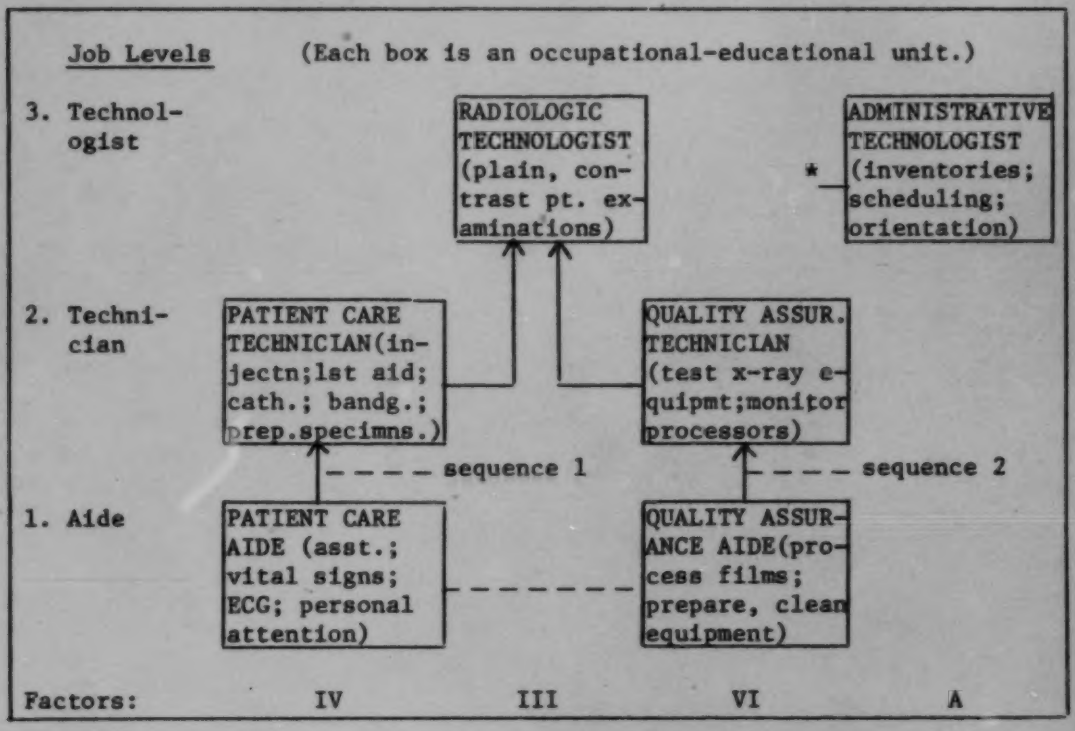
The task annotation data now consists of two sets: one for skills and one for knowledge. Each scale data sheet for each task should be stapled to its annotation sheets. The data within each set should then be arranged in numerical order by Task Code Number for easy access until the final arrangement by number within occupational-educational units.

Occupational-Educational Units

Each job level within each factor is an occupational-educational unit. The assignment of tasks to occupational-educational units is determined by the prior analytic procedures described in Volume 3 of this report. Statistical analysis determines how many curriculum objectives will be required for a unit, since one is written for each scale value of each skill and knowledge category required for each occupational-educational unit. The curriculum analyst obtains the analytic results in which Task Code Numbers are assigned to occupational-educational units in order to proceed.

The preparation of curriculum objectives for each occupational-educational unit provides program designers with the option of combining or separating curriculum objectives for skills and knowledges as appropriate to their programs. For example, as Figure 2 indicates,

Figure 2. JOBS AND JOB SEQUENCES COVERED BY CURRICULUM OUTLINES IN RESEARCH REPORT NO. 8


Job Levels
(Each box is an occupational-educational unit.)
3. Technologist
2. Technician
1. Aide
RADIOLOGIC TECHNOLOGIST (plain, contrast pt. examinations)
ADMINISTRATIVE TECHNOLOGIST (inventories; scheduling; orientation)
*
PATIENT CARE TECHNICIAN(injectn;1st aid; cath.; bandg.; prep.specimns.)
QUALITY ASSUR. TECHNICIAN (test x-ray equipmt;monitor processors)
sequence 1
sequence 2
PATIENT CARE AIDE (asst.; vital signs; ECG; personal attention)
QUALITY ASSURANCE AIDE(process films; prepare, clean equipment)
Factors: IV III VI A

Sequence 1: from aide to technician in patient care, and then to radiologic technologist.

Sequence 2: from aide to technician in quality assurance, and then to radiologic technologist.

* This occupational-educational unit is treated separately so that it can be added to any other unit if desired; it does not constitute a job structure in and of itself.

the curriculum objectives related to radiologic technology in Research Report No. 8 cover six occupational-educational units. These six units reflect four factors and three job levels. A traditional educational program for radiologic technologist might combine them all, but we recommended two sequences of course work. While the curriculum objectives we wrote can be used in a single program, we arranged them for

use in two or more educational ladders, each of which involved three distinct job levels.

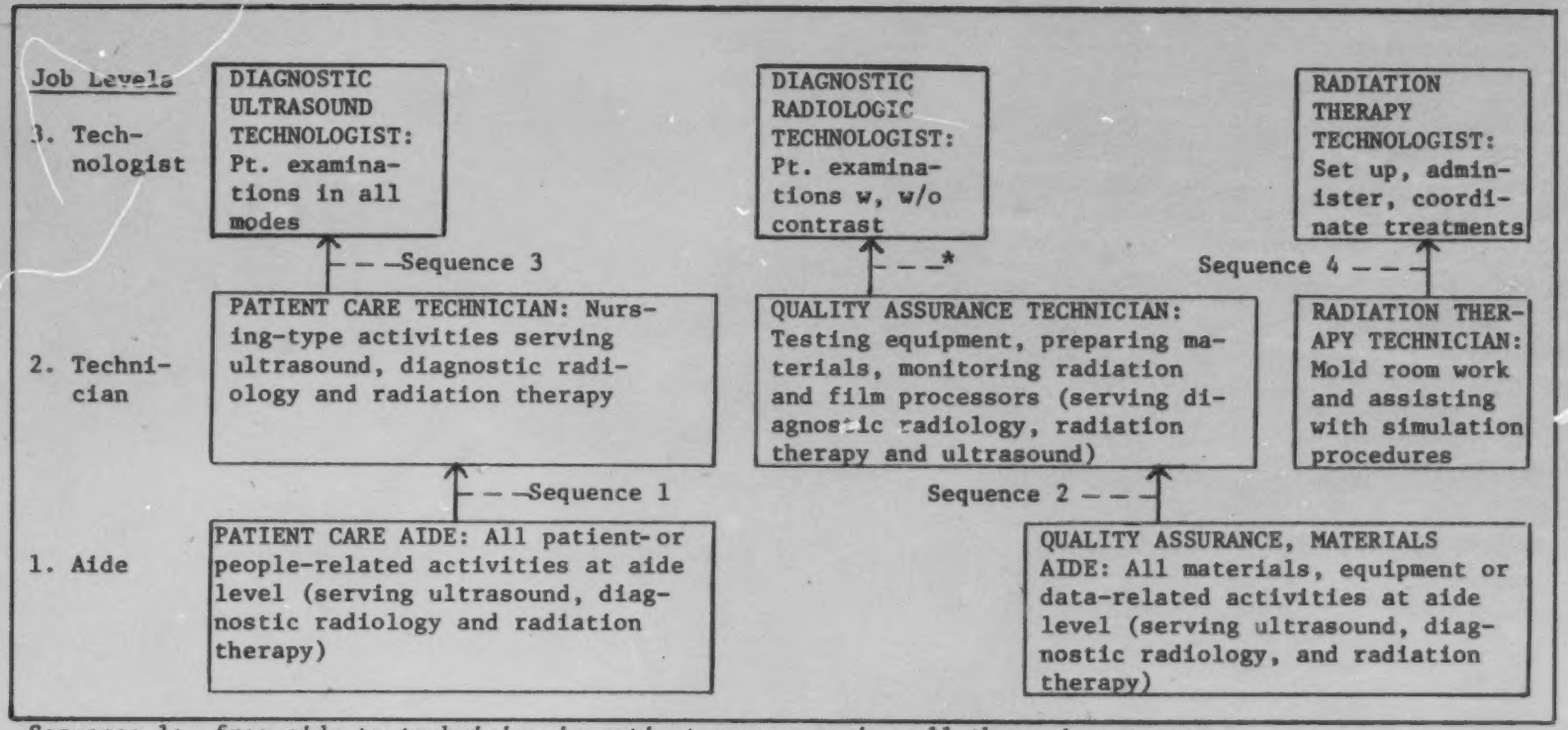
The HSMS curriculum objectives are usable for multi-factor occupations as well as for single factor jobs, depending on whether units are consolidated or treated separately. Figure 3 presents the eight occupational-educational units reported in Research Report No. 10. Occupational-educational units that appeared in Research Report No. 8 at the aide and technician levels were expanded in the latter report to incorporate related tasks serving diagnostic ultrasound and radiation therapy. The original scope of the curriculum objectives was expanded, and additional sequences became possible.

Arrangement of Task Data

At this stage of preparation the curriculum analyst arranges the task data (scale sheets attached to annotation sheets) so that the tasks assigned to each occupational-educational unit are in numerical order by Task Code Number within the unit. In each unit they are put in the order in which curriculum objectives will be written, in rising order by job level within each factor. When more than one factor is to be covered, as in Figure 2 (which has two units per job level and four factors), an arbitrary decision is made as to the order in which to deal with the factors. In Research Report No. 8, we used the following order:

1. Patient care aide (Level 1)
2. Patient care technician (Level 2)
3. Quality assurance aide (Level 1)
4. Quality assurance technician (Level 2)
5. Radiologic technologist (Level 3)
6. Administrative technologist (Level 3)

Figure 3. JOBS AND JOB SEQUENCES COVERED BY CURRICULUM OUTLINES IN RESEARCH REPORT NO. 10


Job Levels
3. Technologist
2. Technician
1. Aide
DIAGNOSTIC ULTRASOUND TECHNOLOGIST: Pt. examinations in all modes
DIAGNOSTIC RADIOLOGIC TECHNOLOGIST: Pt. examinations w, w/o contrast
RADIATION THERAPY TECHNOLOGIST: Set up, administer, coordinate treatments
Sequence 3
*
Sequence 4
PATIENT CARE TECHNICIAN: Nursing-type activities serving ultrasound, diagnostic radiology and radiation therapy
QUALITY ASSURANCE TECHNICIAN: Testing equipment, preparing materials, monitoring radiation and film processors (serving diagnostic radiology, radiation therapy and ultrasound)
RADIATION THERAPY TECHNICIAN: Mold room work and assisting with simulation procedures
Sequence 1
Sequence 2
PATIENT CARE AIDE: All patient-or people-related activities at aide level (serving ultrasound, diagnostic radiology and radiation therapy)
QUALITY ASSURANCE, MATERIALS AIDE: All materials, equipment or data-related activities at aide level (serving ultrasound, diagnostic radiology, and radiation therapy)

Sequence 1: from aide to technician in patient care, serving all three departments.
Sequence 2: from aide to technician in quality assurance-materials, serving all three departments.
Sequence 3: from patient care technician to ultrasound technologist.
Sequence 4: from radiation therapy technician to radiation therapy technologist.
* This sequence from quality assurance technician to radiologic technologist is covered in Research Report No. 8.

PREPARATION OF CURRICULUM OUTLINES

The MATRIX Arrays

The HSMS MATRIX computer program allows the user to examine the skill and knowledge requirements for any group of tasks in any order desired.[4] For curriculum design purposes we order a separate MATRIX run for each occupational-educational unit, with the tasks listed in numerical order by Task Code Number. The MATRIX printout presents the task data being examined in an array in which the tasks are arranged in columns from left to right in the order selected. The rows are all the skills and knowledge categories required, listed from top to bottom in the order in which they appear in the tasks (as arranged from left to right). The entries are the scale values with the decimal points omitted. By reading across a row one can see the tasks for which a given skill or knowledge category is required, and at what scale values. Figure 4 is an example of such an array. It is a part of the MATRIX array for the aide level of Factor IV, a patient care factor reported in Research Report No. 8.

The MATRIX printout also includes the following:

1. A list of tasks in the array giving the Task Code Number and abbreviated name, presented in the order entered. The tasks are given internal numbers, and the last number is the total number of tasks in the array.

2. A list of the skill and knowledge categories represented in the array, with the skills first, followed by the knowledge category code numbers in numerical order; also, frequencies across tasks.

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[4] Volume 3 of this report describes the MATRIX program and includes a program listing.

Figure 4. EXAMPLE OF MATRIX ARRAY FOR AN OCCUPATIONAL-EDUCATIONAL UNIT

MATRIX IN NUMERICAL ORDER NO. TASKS = 10			NO. CATEGORIES = 14						PATIENT CARE FACTOR LEVEL 1	
T S N K O: 7 3	7 4	9 8	11 3	13 8	15 3	15 5	16 6	19 0	19 3	SKILL OR CATEGORY
50	30	30	30	50	50	30	10	10	30	HUM INTR
40	40	40	40	40	40	40	20	20	40	ORAL USE
45		15	45	45		30	30	30	30	METHODS
70	70		70	70	15		35	70	20	QUALITY
20										IMPLICIT
10	10	10	10	10	10	10	10			FINC ERR
10	10	10	10	30	30	10	30	55	20	HUMN ERR
25	25									12223000
	20	20			20	20	20	20	20	READ USE
		15			15		15			OBJ MANP
					15	15	25	25	35	11737300
					25		35		15	11738000
							30			GDG-STRG
									25	11731200

Source: Based on patient care factor at level 1 which actually contains 30 tasks and 21 categories: Research Report No. 8, Volume 2.

As Figure 4 indicates, some skills or knowledge categories are required at the same scale value for all tasks within an occupational-educational unit, and some are required at more than one scale value. Not all tasks require a given skill or category. The analyst writes a curriculum objective for every skill and every knowledge category at each scale value required for any of the tasks covered by an occupational-educational unit. He is able to determine how many curriculum objectives will be required by referring to the MATRIX array for the occupational unit. Figure 4 calls for 29 curriculum objectives. The first line requires three, the second two, the third three, etc., one for each scale value on a line.

Sample Curriculum Outline

Curriculum outlines are used to order the skill, knowledge, and procedural objectives for a given occupational-educational unit. They list the scale values, identify the tasks whose descriptive language is to be reflected in each objective, and are used to assign numbers to the curriculum objectives. The MATRIX arrays are the raw data base for the outlines.

A curriculum outline presents the skill scale names in order by their HSMS scale numbers, followed by the knowledge category names in rising order by code number, followed by one procedural objective for each occupational-educational unit. The MATRIX category listing tells the analyst the order in which to lay out the knowledge categories in the outline, and the array itself tells the analyst which tasks require which scale values.

Figure 5 is an example of a curriculum outline for the MATRIX array presented in Figure 4. The far left column presents the categories in order as described. The next column shows the scale values. The column to the right of that lists the Task Code Numbers of the tasks that require the category at the given scale value.

There are as many curriculum objectives for a skill or knowledge category as there are scale values in the MATRIX array. Each curriculum objective receives a curriculum objective number; the numbers can be assigned arbitrarily, in any order. The ones listed

Figure 5. EXAMPLE OF CURRICULUM OUTLINE:
CURRICULUM OBJECTIVES REQUIRED FOR FIGURE 4

Abbreviated Name of Skill or Knowledge Category	Scale Value	Level 1 Aide Tasks	Curriculum Objective No.
Object Manipulation Skills	1.5	98 153 166	1*
Guiding or Steering Skills	3.0	190	18
Human Interaction Skills	1.0	166 190	20
	3.0	74 98 113 155 193	26*
	5.0	73 138 153	32*
Oral Use of a Relevant Language	2.0	166 190	42
	4.0	73 74 98 113 138 153 155 193	47*
Reading Use of a Relevant Language	2.0	74 98 153 155 166 190 193	54*
Decision Making on Methods	1.5	98	71
	3.0	155 166 190 193	77
	4.5	73 113 138	83*
Decision Making on Quality	1.5	153	87*
	2.0	193	89
	3.5	166	93
	7.0	73 74 113 138 190	101*
Implicative Skills	2.0	73	124
Financial Consequences of Error	1.0	73 74 98 113 138 153 155 166	129*
Consequences of Error to Humans	1.0	73 74 98 113 155	138*
	2.0	193	144
	3.0	138 153 166	148*
	5.5	190	153
11731200 Topographic Anatomy	2.5	193	172
11737300 Handling, transportation of the sick or wounded	1.5	153 155	246*
	2.5	166 190	247
	3.5	193	250
11738000 Asepsis	1.5	193	265
	2.5	153	268*
	3.5	166	272
12223000 Diagnostic radiography	2.5	73 74	285*
Procedural Objective (task sequences and equipment not elsewhere covered)	—	73 74 98 113 138 153 155 166 190 193	346*

* Curriculum objectives marked with asterisk and listed by number in the far right column may be found in Appendix D.

in the far right column of Figure 5 are the actual numbers assigned in Research Report No. 8, which is why they are not in continuous order.

The analyst proceeds as follows to prepare the curriculum outline using the MATRIX array:

1. The analyst works with one skill or knowledge category at a time, following the preset order for the outline (not the order found on the left side of the MATRIX array). He or she enters the skill scale name or the code number and abbreviated knowledge category name in the far left column.

2. For each skill or category the analyst finds its line in the MATRIX array.

   a. The analyst enters in the next column of the outline the lowest scale value found on the line, and circles the entries with that value.

   b. The analyst enters in the outline the Task Code Numbers of the tasks whose scale values have been circled for that line. For example, for Human Interaction Skills, Tasks 166 and 190 are required at scale value 1.0. These are entered.

   c. The analyst goes on to the next higher scale value and repeats the process. Tasks 74, 98, 113, 155, and 193 are required at scale value 3.0 for Human Interaction Skills. Using color coded circles and marks for values as they are covered avoids confusion and error.

   d. The analyst continues for all other scale values. Tasks 73, 138, and 153 are required at 5.0. Thus, for Human Interaction Skills, three curriculum objectives are called for.

3. The analyst goes on to the next skill or knowledge category, and repeats the process until the entire outline is completed, covering every scale value for every skill and knowledge category in the MATRIX array.

4. The last entry in the far left column is the procedural objective for each occupational-educational unit. It has no scale value and includes all the tasks of the unit.

5. Numbers are assigned to each curriculum objective.

Curriculum Outlines for Educational Ladders

Figure 5 is an example of what a curriculum outline would look like for a single occupational-educational unit. However, HSMS curriculum outlines are usually referenced to several job structures which emerge after factor analysis, such as in Figures 2 and 3. They usually cover more than one job level and factor and suggest the sequencing of educational ladders to parallel job ladders. Thus, the HSMS curriculum outlines are usually arranged in major column divisions, one for each job level in a sequence. Figure C.2 in Appendix C is an outline for a three-step sequence from aide, to technician, to technologist in patient care and radiologic technology.

The sequences we suggest are sometimes alternatives to reach a given job (e.g., sequences 1 and 2 in Figure 2). We arrange such alternatives in separate outlines and, as a result, since these end in the same occupational-educational unit, we prepare overall outlines which serve as indexes for the curriculum objectives which are to be written. The indexes include summary data for all the MATRIX arrays for all the occupational-educational units to be covered by all the curriculum outlines and objectives. They list each skill or knowledge scale value in order by the HSMS skill scale number, followed by the knowledge categories by code number and then the procedural objectives for each unit. They list the unit's factor and job level, but not its Task Code Numbers.

Figure 6 presents two alternative ways of laying out an index outline. Example A was used for Research Report No. 8. As can be seen, the far right column shows the curriculum objective numbers.

Figure 6. EXAMPLES OF TABLE HEADINGS FOR INDEX OF CURRICULUM OBJECTIVES

Example A: Job Levels and Curriculum Objective Numbers Entered

Table ___. p. 1 of ___

Abbreviated Name of Skill or Knowledge Category	Scale Value	Job Levels by Factor				Curriculum Objective Nos.					
		Pt. Care	Qual. Assur.	Rad. Tech.	Admin. (A)	Pt Care		Qual. Assur.		Rad. Tech.	Adm. (A)
Object Manipulation Skills	1.5	1, 2	1, 2	3		1	2	3	4	5	
	3.5	1, 2	1, 2	3		6	7	8	9	10	
	5.0	2	1			11		12			
	7.5	2				13					
Guiding or Steering Skills	1.5	1	1, 2	3		14		15	16	17	
	3.0	1, 2				18	19				
Human Interaction Skills	1.0	1, 2	1, 2	3	3	20	21	22	23	24	25
	3.0	1, 2	1, 2	3	3	26	27	28	29	30	31
	5.0	1, 2		3	3	32	33			34	35
	7.0	2				36					

etc. See Appendix C.

Example B: Curriculum Objective Numbers Entered*

Table ___. p. 1 of ___

Abbreviated Name of Skill or Knowledge Category	Scale Value	Patient Care		Radiology Quality Assurance, Materials			Radiation Therapy		Ultra-sound	Radi-ologic
		Aide Level 1	Techn. Level 2	Aide Level 1	Techn. Level 2	Physt. Level 5	Techn Level 2	Tech. Level 3	Tech. Level 3	Tech. Level 3
Object Manipulation Skills	1.5	1	2	3	4		5	6	7	8
	3.5	9	10	11	12		13	14		15
	5.0		16	17						
	7.5			18						
Guiding or Steering Skills	1.5	19	20	21	22		23	24		25
	3.0	26	27						28	
	5.5								29	
Human Interaction Skills	1.0	30	31	32	33		34			35
	3.0	36	37	38	39	40	41	42		43
	5.0	44	45			46	47	48	49	50
	7.0		51					52		

* Numbers are illustrative. etc.

These correspond to a given scale value for a skill or knowledge category for a given occupational-educational unit. The curriculum objective numbers are assigned in numerical order. (Example B was used in Research Report No. 10, for which no curriculum objectives were written; the curriculum objective numbers are merely illustrative.)

Since the index outlines show the scale values in rising order, the curriculum objectives are given numbers such that all the objectives for a given scale value are numbered before those for the next higher scale value.

The objectives are then written in numerical order. This guarantees that the curriculum objectives for the lowest scale value of a skill or knowledge are written first (one for each unit that requires it), before those for the next higher scale value. For example, in Figure 6, Example A, we would write five curriculum objectives for Object Manipulation Skills for scale value 1.5, then five for scale value 3.5, two for 5.0, and one for 7.5. Next would come four for scale value 1.5 for Guiding or Steering Skills, and so on.

By proceeding in this way when writing the objectives, we are able to pay attention to the additive nature of the curriculum objectives; we are able to use similar language for similar activities; and we are able to check any remaining computer errors or discrepancies in the skill and knowledge scale data. We work first with the skills, then the knowledge categories, and finally with the procedural objectives. The index outlines are, therefore, used to number the

curriculum objectives and order the work by virtue of the numerical ordering of the objectives.[5]

Figure 7 presents examples of table headings for curriculum outlines for educational ladders. Example A corresponds to sequence 2 in Figure 2. It is part of a page from the middle of the table, and illustrates some of the features of the arrangement. Example A assumes that the radiologic technologist job is reached in three stages: from aide to technician in quality assurance, and then to technologist in radiologic technology. (Figure C.2 in Appendix C also assumes that the radiologic technologist job is reached in three stages: from aide to technician in patient care, and then to technologist in radiologic technology.)

The curriculum outline shows the curriculum objective number associated with each skill and knowledge category by scale value. The information is arranged in three major columns: one for the aide, one for the technician, and one for the technologist. Within each of the three major columns one finds the Task Code Numbers associated with a given curriculum objective. The column for the aide level ends when all the skill and knowledge objectives required for level 1 are presented. The table continues with a list of curriculum objectives for skills and knowledges required at level 2, but not at level 1, and then continues with those required only at level 3. Each column ends with the number of a procedural objective next to which all the Task Code Numbers associated with the given occupational-educational unit are listed.

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[5] As easy way to prepare for an index outline is to have a single MATRIX run covering the tasks in all the units for which curriculum objectives are to be written, with tasks in the order discussed on page 2-10.

Figure 7. EXAMPLE OF TABLE HEADINGS FOR CURRICULUM OUTLINES

Example A: Skill and Knowledge Categories Arranged in Preset Order: Lowest Job Level and Then Succeeding Levels (Three-Step Sequence)

Table __. p. __ of __

Skill or Knowledge Category (abbreviated)		Scale Value	Level 1: Aide	Level 2: Technician		Level 3: Technologist	
			Not Required	Task Codes	Curric. Ob.Nos.	Task Codes	Curric. Ob.Nos.
Factors:				Quality Assurance (VI)		Rad. Technology (III)	
24110000	Electromagnetic field theory applications	1.5		535	332		
24132100	Electronic devices	1.5		532 535 545 548 549 550 556	333		
51200000	Algebra	1.5		173 529 530 531 535	338	355 356 357 358 359 360 361 362 365 375 491 492 493 494 495 496 511 518	339

Source: Research Report No. 8, Vol. 2. etc. Similar table appears in Appendix C.

Example B: Skill and Knowledge Categories Arranged in Overall Preset Order (Two-Step Sequence)

Table __. p. __ of __

Abbreviated	Name of Skill or Knowledge Category	Scale Value	Level 2 Technician Tasks	Curric. Obj.No.*	Level 3 Technologist Tasks	Curric. Obj.No.*
11731820	Bones and joints	2.5			563 566 567 568 569 570 571 572 573 575 599 600 601 602 603 604 605 606 607 608 609	209
11731831	Skin and sweat glands	1.5	587	210	565	211
		2.5			601	212
11731910	Central nervous system	2.5			563 599	213
11731943	Eye and optic nerve	1.5	594	214	563 583 599	215
11731945	The ear	1.5			563 599	216

Source: Research Report No. 10. etc. * Numbers are illustrative.

Reading down the column for level 1 provides the numbers for all the curriculum objectives for the aide. Reading down the column for level 2 provides the numbers for all the curriculum objectives for the technician. Reading down the column for level 3 provides the numbers of all the curriculum objectives for the radiologic technologist. Since these columns also provide the Task Code Numbers associated with each curriculum objective, the tables are indexes of the task descriptions that can be used as instructional materials.

By reading across the rows, the program designer can determine whether a given skill or knowledge objective has been preceded by or will be followed by curriculum objectives for the given skill or knowledge at the same, higher, or lower scale values in any of the other job levels covered. He or she can decide to use or refer to the other curriculum objectives in instructional planning or can combine them. If levels 1, 2 or 3 are combined in a given program, the table makes it easy to combine or sequence curriculum objectives by order of scale value.

Example B of Figure 7 is part of a page from an outline for a two-step sequence (sequence 4 of Figure 3). The sequence, from the technician to the technologist level in radiation therapy, was reported in Research Report No. 10. This arrangement follows the preset order of skill scales by scale number, followed by knowledge categories by code number order, regardless of whether a skill or knowledge category is required for the lowest level. For example, category 11731820 "Bones and joints" is not needed for level 2, but it is shown in its proper numerical order.

The lay-out in Example B is best for use by an educational institution that may not subscribe to the educational ladder approach. It is possible to treat each of the skills and knowledges at each scale value as a unit by combining the objectives across occupational-educational units; the program designer can order the curriculum so that activities at lower scale values of the skills and knowledges are taught before higher ones are taught. It is also possible to examine all the skills and knowledges and decide on the best order of presentation from the point of view of logic or the nature of the disciplines.

The curriculum analyst prepares the data for curriculum outlines for educational sequences in the manner described for the illustration shown in Figure 5. The only difference is the ordering. For Example A of Figure 7 the outline first presents those skills and categories required at the lowest job level in the sequence. These rows are also filled out for the other job levels. The last entry for the lowest job level is the procedural objective. The outline then continues, presenting those skills or categories needed for the second level but not required at the lowest level. It ends with those skills and categories needed at the third (or highest) job level in the sequence.

The analyst fills out each row by working with each MATRIX array for each unit in turn, one skill scale value at a time, skill by skill, and category by category. Figure C.2 in Appendix C can be used as a model.

CURRICULUM OBJECTIVES: PREPARATION

The units of HSMS-designed curricula are curriculum objectives, i.e., intended learning outcomes expressed as behavioral statements. They are written in standard formats. Each curriculum objective is originally prepared from a blank Curriculum Objective Sheet as presented in Figure 8. What is filled in can be divided into three separate parts:

1. Identification information.
2. Prototype language for type of objective, whether skill, knowledge or procedural.
3. Specific task description language for the given curriculum objective.

Identification Information

The curriculum outlines contain all the identification information needed to prepare for writing curriculum objectives. The outlines indicate the number of each curriculum objective required, the type of objective, the skill or knowledge category, the scale value, the factor, the job level, and the Task Code Numbers to which a given curriculum objective refers. In addition, the curriculum outlines indicate the numbers of the other curriculum objectives for a given skill or knowledge category. All this information is called for on each Curriculum Objective Sheet.

The curriculum outlines are used to prepare a Curriculum Objective Sheet for each curriculum objective to be written. The Sheets are first given their curriculum objective numbers. The space for this appears on the first line at the top, on the far right: "No. _____."

Figure 8. BLANK CURRICULUM OBJECTIVE SHEET

CURRICULUM OBJECTIVE SHEET Page 1 of

Type of Objective _____ Factor _____ No. _____

Skill or Knowledge Category _____ Scale Value ____

Occupation _____ Level ____

Refers to Task Code No(s).: _____

_____

_____

Is there Cross Reference? ...Yes( ) ...No( ) If yes, see footnote(s).

_____

Content: A graduate of the program at this educational level must be able to

[Prototype language]

[Specific task description language]

Figure 8. BLANK CURRICULUM OBJECTIVE SHEET (continued)

CURRICULUM OBJECTIVE SHEET (continued) Page of

Type of Objective _____ Factor _____ No. _____

Skill or Knowledge Cagegory _____ Scale Value ____

Content Continued

[Ending prototype language (if any)]

Cross Reference Footnotes: See The Following Curriculum Objectives:

Lower scale value appears in:

Same scale value appears in:

Higher scale value appears in:

The curriculum outline tells the curriculum analyst which skill or knowledge category, scale value, and tasks covered by each curriculum objective number. Using the appropriate curriculum index and/or the curriculum outline, the analyst finds the given data for each curriculum objective number in turn, and fills out the following information on the Curriculum Objective Sheet:

1. Type of Objective: whether skill, knowledge, or procedural.

2. Factor: the number of the task factor (III, IV, VI or A for Research Report No. 8); the name of the factor can also be used.

3. Skill or Knowledge Category: the name of the skill or the code number of the knowledge category; N.A. for procedural objectives.

4. Scale value: the scale value at which the specific task description language in the curriculum objective is rated; N.A. for procedural objectives.

5. Occupation: the name of the job (in generic terms) reflecting its function and HSMS job level, such as patient care aide, quality assurance technician, radiologic technologist, etc.

6. Level: the HSMS job level to which the tasks covered by the given curriculum objective have been assigned.

7. Refers to Task Code No(s).: the Task Code Numbers of the tasks covered by this curriculum objective, i.e., tasks that have been scaled at this scale value for this skill or knowledge category whose language is reflected in the curriculum objective. These are listed in the curriculum outline, based on the MATRIX arrays.

8. Is there Cross Reference?: "Yes" if the same skill or knowledge category appears in any other curriculum objective at a lower scale value, at the same scale value, at a higher scale value, or if the skill or knowledge category appears in tasks higher on the job ladder than is represented in the set of curriculum objectives being prepared.

9. Cross Reference Footnotes: the footnotes tell the user the numbers of the curriculum objectives that are at lower, the same, or higher scale values, or state the higher job level. This can be determined from the curriculum outline index.

Prototype Language

Appendix A presents the prototypes for HSMS curriculum objectives. All the curriculum objectives start out with a classic opening for a behavioral objective: "A graduate of the program at this educational level must be able to...," as shown in Figure 8. Each then continues with the content of the curriculum objective. A prototype for each type of curriculum objective has been developed. Each (except the procedural objectives) utilizes an HSMS skill or knowledge category, a scale, and language from relevant task descriptions or summaries. The curriculum objectives for skills and knowledge categories are written so that the program designer is not required to be familiar with the HSMS method or scales in order to understand what is being referred to by the skill or knowledge category names or the scale values involved.

Each HSMS skill objective has a prototype introductory paragraph that summarizes the kind of behavior that characterizes the skill, regardless of scale value. Most skill objectives end with a prototype paragraph that begins, "To accomplish this, the student must be able to...." These indicate a context for demonstration of mastery. Between the opening and closing paragraphs in any given skill objective the analyst includes specific language from the task descriptions

in the occupational-educational unit which demonstrates the given scale value of the skill. These are presented as numbered paragraphs.

There is one prototype for all the knowledge objectives. It first names the knowledge category and any relevant explanations of what is covered by the category. This is followed by numbered paragraphs which include specific task language which indicates how the knowledge is applied. There is a closing prototype paragraph which indicates the context for demonstrating mastery.

There is one procedural objective for each occupational-educational unit. These list each task in a given unit. The prototype calls for the student to demonstrate knowledge of the proper sequence of events and contingencies associated with each task, proper use of all equipment not already covered by skill or knowledge objectives, and application of non-scalable knowledge, such as arithmetic when it is called for in conjunction with mathematical knowledge or symbolic skills. The prototype then calls for a list, by abbreviated name and code, of all the tasks covered by the occupational-educational unit.

The analyst's second major duty, after filling in the identification information called for as described above, is to select the appropriate prototype language for each objective. At HSMS we did this by making enough photocopies of the prototypes to cover each skill, knowledge, and procedural objective. We placed the closing prototype paragraphs (which follow the task description language) just above the Cross Reference Footnotes. The latter two ending sections can easily be moved to the last sheet of the given curriculum objec-

tive after the numbered task description sections are written. The following are general rules for preparing the prototypes:

1. Two of the skill prototypes require the analyst to decide whether Prototype A or B (or both) is appropriate. This can only be decided after the task language is known. The choices are determined as follows:

   a. Guiding or Steering Skills:
   Prototype A refers to control of an object being moved over a predetermined pathway.
   Prototype B refers to control of an object being held steady on a moving target.

   b. Taxonomic Skills:
   Prototype A refers to the conscious application of existing conceptual classifying or organizing principles.
   Prototype B refers to the conscious creation of conceptual classifying or organizing principles.

2. Two of the skill scales do not require task specific language because the entire task is the referent. It is sufficient to list the abbreviated task names and Task Code Numbers for the tasks that happen to be scaled at the scale value for the given curriculum objective. The scales are: Financial Consequences of Error and Consequences of Error to Humans.

3. A separate knowledge prototype is developed for each knowledge category:

   a. The prototype calls for inclusion of the full name of the knowledge category as found in the Knowledge Classification System, except for "For ___, see ___" and "See also ___" statements. The analyst may also include explanatory content taken from the Special Section of the Knowledge Classification System (Volume 1 of this report).

   b. In cases where a broad-level knowledge category is to be represented in curriculum objectives as well as its fine-level subdivision categories, it is wise to add a word or two to the name, to indicate the separate meaning of the broad-level

category. See, for example, the following listing for Normal Structure and Function:

Normal Structure and Function (human anatomy and physiology; an overview of the nature of the normal structure, function, and/or interrelationships of systems and processes) See Curriculum Objective 162

3. The procedural objective prototype lists three types of content: (1) the sequence of events in the tasks; (2) use of equipment called for in the tasks; and (3) application of arithmetic if any tasks call for numerical symbolic skills or algebra. Whether the second and third types of content are relevant for a given procedural objective can only be determined once the task language is known. The irrelevant requirements are deleted when the curriculum objective is being written.

WRITING CURRICULUM OBJECTIVES: SPECIFIC TASK LANGUAGE

The language of the annotated task descriptions is used in writing the numbered items of the curriculum objectives. This section indicates how to write the numbered sections. In order to follow the discussion, we suggest that the curriculum analyst study this section and also follow the examples used to illustrate the process in Appendix A (which presents the prototypes), Appendix B (which includes actual skill and knowledge scale data and annotation sheets), and Appendix D (which contains actual curriculum objectives).

Three of the five tasks covered in Appendix B (Task Codes 74, 138, and 153) appear in Figures 4 and 5. The two other tasks (Task Codes 182 and 533) were used as examples in Volume 2 of this report.

Appendix D contains every curriculum objective in which any of these five tasks is represented, so the reader can see how the task

language is translated into curriculum objectives and consolidated with the language of other tasks. Figure 9 is a guide to the curriculum objectives for the five tasks in Appendix B. The curriculum objectives in Appendix D have circles and arrows which call attention to the tasks.

Appendix D also contains several additional curriculum objectives so the reader can see how various problems are dealt with. These examples of curriculum objectives cover most of the prototypes. We did not include examples of curriculum objectives for Locomotion Skills and the two prototype B versions described earlier, because none of these were ever called for in the work carried out by HSMS.

Figure 9. GUIDE TO USE OF APPENDIX B AND D EXAMPLES

Task Code No.	Factor	Job Level	Skill Objective Number[a]	Knowledge Objective Number[a]	Procedural Objective Number[a]
74[b]	Patient care (IV)	Aide (1)	26 47 54 101 129 138	285	346
138[b]	Patient care (IV)	Aide (1)	32 47 83 101 129	none	346
153[b]	Patient care (IV)	Aide (1)	1 32 47 54 87 129 148	246 268	346
182	Patient care (IV)	Technician (2)	7 19 33 48 55 78 102 120 145	225 342	347
533	Quality Assurance(IV)	Technician (2)	29 50 62 67 80 103 108 122 132 156	279 290 330 343	349

Task description annotation sheets, Skill Scaling Sheets, and Knowledge Identification Sheets for these five tasks appear in Appendix B.

[a] The curriculum objectives listed above appear in Appendix D in numerical order.

[b] Tasks 74, 138 and 153 are represented in Figures 4 and 5.

General Rules

Below are a few guidelines for writing curriculum objectives which make manageable what could be a staggering amount of work:

1. The analyst writes only one skill objective for a given skill scale value within any given occupational-educational unit regardless of the variety of task contexts in which it is needed.

   a. When the same kind of activity appears in more than one task, a single content statement is prepared. This makes it possible to consolidate a good deal of task material.

   b. There are as many statements for a given skill objective as there are different activities that require the application of the skill at the scale value involved.

   c. The appropriate Task Code Numbers are listed after each numbered content statement.

2. The analyst writes only one knowledge objective for a given scale value for a knowledge category within any given occupational-educational unit regardless of how different the activities are or how different the particular components of the subject area are.

   a. For a given knowledge objective, when the same language appears in several tasks, one statement is written to cover it.

   b. There are as many statements in a given knowledge objective as there are different descriptions of activities that require the knowledge, or different areas of the subject matter in the given category.

   c. The statements are numbered, and each is followed by its Task Code Number references, or the reader is referred to the Task Code Numbers at the top of the Curriculum Objective Sheet.

3. Each numbered statement is written so that a reader can understand the context in which the task activities take place without having to refer to the original task descriptions.

4. The numbered statements should retain as much as possible of the language of the task descriptions. They need not indicate the substantive material that must be learned by the student in order to master the behavior. That is left to instructional planning.

General Procedures

In writing the specific content for the curriculum objectives for a given program, the curriculum analyst uses the annotated task descriptions and scale data arranged in order by occupational-educational units, and the Curriculum Objective Sheets which have been prepared with identification information and prototype language. These Sheets are now arranged in numerical order by Curriculum Objective Number. The objectives are written, one at a time, in that order.

The analyst picks up the first Curriculum Objective Sheet and reads the skill or knowledge called for, the scale value, the factor, the occupation, and the job level. This tells the analyst which occupational-educational unit to work with. The appropriate set of annotation sheets and scale data are then taken from the file.

The line on the Curriculum Objective Sheet indicating the Task Code Numbers for the objective tells the analyst which annotation sheets to work with. Task by task the analyst identifies and reads all the annotated task language for the given skill at the given scale value or the knowledge category. The analyst determines whether there is a common activity or set of activities involved. The task elements which portray each separate activity are photocopied, cut out and mounted on sheet(s) of paper, or paraphrased and mounted. These sheets are fully identified. Covering one task at a time, the analyst

lists the Task Code Number next to task activity language already mounted on the sheets, or adds new sections or paraphrases task language and adds the task's Code Number. Every instance of use of the skill at the given scale value or of the knowledge category whenever it is required, is accounted for in this way.

This process continues until all the tasks listed at the top of the Curriculum Objective Sheet have been examined, and every annotated section for the skill or knowledge category is represented on the sheet(s) for the given curriculum objective.

These language sections are now written as statements so that they make sense and account for the annotated activities in the tasks. If only a single task is associated with a given activity, the context for this can be stated fairly easily. A statement covering several tasks must apply to all. When activities are similar, a single overall statement can be written. The following examples may help:

For Human Interaction Skills at 5.0, the first item below covers four tasks, thus linking the language in more than one task; the second item covers only Task 138:

1. Reassuring patient and/or accompanying adult about procedures; explaining what will happen; helping to calm or comfort patient and/or adult by being sympathetic and behaving in an interested and professional manner (Tasks 73, 153, 290, 490).

2. Noting, while interacting with patient, conditions, symptoms, or behavior which should be brought to physician's attention; noting whether, in conversation, patient mentions symptoms, or worries, or concerns related to health which should be told to physician to aid in caring for patient (Task 138).

Human Interaction Skills: 5.0 Curriculum Objective 32

The examples above did not use the names of the tasks to set a context because the activities are recognizable in many situations. In the example below, some of the abbreviated task name is incorporated into the statement to provide the context:

4. In setting up and using suction machine, taking care to reassure patient and explain; being careful in using suction; continuing until passage is cleared (Task 182).

   Decision Making on Quality: 7.0 Curriculum Objective 102

For a long series of tasks whose language is combined for a single statement, the specific and overall context is given; some activities must be listed in separate statements to be comprehensible:

4. Adjusting visual display on computerized transverse axial equipment to achieve diagnostic quality images by using controls for the white-gray-black scale or for color as available (Task 527).

5. Centering center of cassette, phantom, radiation detection device, beam attenuator, or other test object to x-ray beam by using light field indicator and cross-hair shadows for center of field; with cassettes, placing so that cassette and light field image sides are parallel (Tasks 529, 530, 531, 532, 533, 534, 538, 539, 540, 544, 548).

   Figural Skills: 1.0 Curriculum Objective 108

When all the tasks of a curriculum objective use the skill or knowledge the same way, only one statement is needed, and the reader is referred to the Task Codes at the top of the Curriculum Objective Sheet. In this example the statement is written to incorporate those aspects of the knowledge category that are utilized in the task:

1. Applying details of grammar, punctuation, and spelling in recording results and evaluation of tests of diagnostic x-ray equipment, and recording what was done to correct problems (all tasks listed).

   Mechanics of Writing English: 1.5 Curriculum Objective 343

In Curriculum Objective 115, covering Symbolic Skills at 1.5, three activities were involved in the seventy tasks covered. To save much tedious effort, the following presentation was chosen:

1. Using formula for magnification to solve equations for unknown portions (distances); using arithmetic manipulations and numerical and algebraic symbols (tasks where appropriate).

2. Using conversion charts or posted information to reconvert technical exposure factors to an equivalent output using arithmetic manipulations and numerical symbols (tasks where appropriate).

3. Calculating distances in order to localize lesion using arithmetic manipulations and numerical symbols (Task 374).

Symbolic Skills: 1.5 Curriculum Objective 115

Skill Objectives

A simple translation from task language to a numbered statement for Object Manipulation Skills at 1.5, for Task 153, resulting in a statement for Curriculum Objective 1, is as follows:

Task Language	Numbered Curriculum Statement
6. If requested, performer may help to restrain or immobilize patient or prevent from falling off table.	2. Using restraints to immobilize patient (Task 153).

For Guiding or Steering and Taxonomic Skills, the appropriate prototype is selected based on the task situation:

1. Wheeling patient in stretcher or wheelchair into position to receive suction, gastric lavage or oxygen, taking care that patient is not jostled (Tasks 182, 185).

Guiding or Steering Skills (A): 3.0 Curriculum Objective 19

6. Observing patient throughout procedure and being alert for any signs of pain, emergency, adverse reaction to procedure or contrast medium, or impairment of respiration; noting any signs of malfunction of equipment (all tasks listed except Task 81).

Taxonomic Skills (A): 2.0 Curriculum Objective 118

The last example indicates how a statement which refers to many but not all of the tasks for an objective can be referenced.

The following example shows how some statements can incorporate language from many tasks and/or several parts of a task:

1. Explaining what will happen during procedure to patient and/or accompanying adult using language understandable to the persons involved; explaining use of equipment or materials (Tasks 73, 98, 113, 153, 155, 262, 282, 290, 292, 303, 520, 521).

2. Explaining to patient or family member the procedures to be carried out at home before patient arrives for radiography; explaining what will happen; checking that patient or family member understands (Task 74).

3. In conversation with patient, noting whether patient mentions symptoms or worries related to health, or concerns which would indicate information helpful to physician in caring for patient; reporting to physician or appropriate staff member (Task 138).

Oral Use of a Relevant Language: 4.0 Curriculum Objective 47

Sometimes the statement can pinpoint the Task Code Number within the statement, as follows:

1. Explaining to patient what will be done in drawing blood (Task 18), removing sutures (Task 33), using suction machine (Task 182), administering oxygen (Task 185), applying pressure dressing (Task 522).

Oral Use of a Relevant Language: 4.0 Curriculum Objective 48

The statements should incorporate any explanatory statements written on the annotation sheets; for example, Figure B.4 for Task 138 had notes on Decision Making on Quality which were incorporated as follows:

2. Being alert to notice any symptoms or asking about any concerns manifested by patient that should be brought to the attention of physician or staff, and being careful to report accurately (Task 138).

Decision Making on Quality: 7.0 Curriculum Objective 101

The following example combines various parts of the annotation sheets for Task 533:

3. In testing x-ray equipment, or film, or film processors, or calibrating quality assurance test instruments, being careful to select appropriate test procedures for the equipment involved, carry out each test step carefully, record results accurately, assess results conscientiously, and discuss results with supervisor and/or radiologist in charge so as to assure that patient exposure is minimized, diagnostic reliability is provided, and legal requirements are met (Tasks 529, 530, 531, 532, 533, 535, 537, 539, 540, 543, 544, 548, 549, 556).

Decision Making on Quality: 7.0 Curriculum Objective 103

The statements for Implicative Skills generally begin with the word "Concluding..." or "Concluding whether...":

2. Concluding the likely number of separate specimens that will be prepared during procedure to take extravascular body fluid specimens, washings, cell and/or tissue biopsies (Task 65).

3. Concluding whether medication type or dosage ordered is inappropriate, has already been administered, may be in error or contraindicated for patient; deciding whether to refuse to inject (Task 133, 299).

4. Concluding whether patient's pain or difficulty in passing a urethral catheter warrants termination of procedure and reporting to physician in charge (Tasks 143, 181).

5. Concluding whether tracheostomy passage has been sufficiently cleared by suctioning and whether surrounding area needs cleansing (Task 182).

Implicative Skills: 1.0 Curriculum Objective 120

Knowledge Objectives

It is essential in writing the statements for the knowledge objectives that the reader understand how the knowledge is being applied as well as the context:

1. After reading requisition sheet indicating area of interest, being able to select appropriate film size, patient positions and centering to demonstrate the part of the body involved; being able to consider internal structures in relation to patient positions, taking account of patient's age, sex, size and body type as appropriate for the area of interest (all tasks listed).

2. Considering appropriate shielding for radiosensitive tissue by considering the direction of the central ray and the proximity of tissues in the area of interest to radiosensitive tissues (all tasks listed).

3. Positioning patient in relation to film and x-ray beam to obtain views requested; selecting technical factors appropriate to the area of interest and tissue type involved (all tasks listed).

Regional Anatomy: 3.5 Curriculum Objective 165

1. In assisting with restraining or immobilizing patient or in assisting patient in bathroom, being able to apply information on handling of sick patient as appropriate to the patient's condition (Tasks 153, 155).

Handling and Transportation of the Sick or Wounded: 1.5 Curriculum Objective 246

It may be necessary to indicate what must be understood about a subject area in order to use it, but this does not mean listing the substantive content:

2. In testing x-ray equipment, film processors and x-ray films for conformance to radiation protection standards, conducting radiation protection survey, or calibrating test instruments, understanding the effects of ionizing (x-ray) radiation on human organisms sufficiently to conscientiously apply tests and evaluate conformity with safety requirements; being able to use details

about the effects of ionizing (x-ray) radiation on human tissues to discuss results of tests, such as effect of problems and deviations from acceptable standards on patient exposure (each of the tasks listed except Task 280).

Radiobiology: 2.5 Curriculum Objective 279

1. Taking account of details of x-radiation properties such as scattering, the qualities of radiolucent and radiopaque materials, absorption and density properties of matter to carry out tests of x-ray equipment involving exposure of test films, masking of areas of test films, and attention to personal safety (Tasks 173, 175, 178, 187, 529, 530, 531, 533, 534, 535, 537, 538, 539, 540, 544, 545).

2. In participating in monitoring of personal exposure to radiation, understanding details about the properties and behavior of electromagnetic ionizing radiation such as x-rays, gamma rays in interaction with living tissue (transfer of energy from the radiation to molecules of the cells) and with other forms of matter to be able to take account of scattering, the qualities of radiolucent and radiopaque materials, absorption and density qualities of matter to understand the reason for monitoring, how to deal with the detection device, and to be able to determine when excessive personal exposure may have occurred (Task 280).

3. Applying details about the properties and behavior of electromagnetic ionizing radiation such as x-rays in interaction with living tissue (transfer of energy from the radiation to molecules of the cells) and with other forms of matter (such as attenuating material to reduce the exposure rate of a beam of radiation) to be able to use test equipment such as radiation devices appropriately; to understand and explain the effects of deviations from acceptable safety standards for x-ray equipment on patient exposure and the quality of the radiographic image (Tasks 529, 530, 531, 532, 533, 534, 535, 537, 538, 539, 540, 545, 548, 549, 550).

4. Applying details about the properties and behavior of gamma rays in interaction with living tissue and other matter to safely handle a gamma ray source in producing a standard test film exposure or calibrating test instruments (Tasks 543, 556).

Interaction With Radiation: 1.5 Curriculum Objective 330

A given knowledge objective should include <u>all</u> the language referred to in the task's annotation sheets for the given category, regardless of scale value. For example, for Task 533, Diagnostic Radiog-

raphy is referred to in four distinct places (see Figure B.20). These are reflected as follows:

1. Using an understanding of diagnostic radiography and appropriate details about diagnostic x-ray equipment, technical factors, controls, test materials, collimators, and the interpretaion of radiographic images to carry out tests of x-ray equipment by setting x-ray tube at appropriate test heights, using light system, collimators, setting technical factors, preparing test films, using test objects, making exposures, interpreting test images (Tasks 73, 175, 529, 530, 531, 533, 535, 537, 539, 540, 543, 544).

2. Using an understanding of diagnostic radiography and appropriate details about a variety of diagnostic x-ray equipment, film processors, x-ray film, and special test equipment (such as test top, penetrometer, beam attenuators, test bar or star patterns, pin hole diaphragm, pulse counter, chronometer, oscilloscope, radiation detection device, phantoms, survey meter, kVp, mA, mAs measuring instruments, graph paper, penetrometer test cassettes, ionization chamber, electrometer, filters, sensitometer, radioactive source, TLD packets) to carry out tests of x-ray equipment such as:

   ...check of automatic exposure termination device (Task 533);...

3. Being able to use an understanding of diagnostic radiography and appropriate details about equipment functions and test standards to interpret test results by comparing with test standards: being able to select appropriate course of action such as request repair, shut down equipment (Tasks 173, 175, 529, 530, 531, 532, 533, 534, 535, 537, 538, 539, 540, 543, 544, 548, 549, 550).

   Diagnostic Radiography: 3.5 Curriculum Objective 290

As the examples indicate, the chief skill required by the analyst is taxonomic. The analyst must decide the number of separate statements that must be written for an objective, must be able to characterize the activities across tasks when the language is similar but not identical, and must be able to present both the activities and subject matter in comprehensible language. The HSMS examples are offered as guides; they may not be the best or only way to present the material.

In the examples above, we used the lists of things used, shown on the first page of each task description, as inventories to be accounted for. The use of specialized equipment is part of the knowledge covered by categories such as "diagnostic radiology."

Procedural Objectives

The analyst determines whether any mathematics knowledge categories and/or symbolic skills were required for a given occupational-educational unit and modifies the prototype for procedural objectives as appropriate. In Appendix D, only the procedural objective for the quality assurance technician (Curriculum Objective 349) requires arithmetic. The others have the reference deleted.

The approved task descriptions are the references for the procedural objectives; this transforms the task descriptions into instructional materials, and focuses the evaluation of the student's mastery on the clinical or clinical simulation setting.

REVIEW

The curriculum objectives must be checked for accuracy, comprehensive coverage, understandable language, and faithful transmittal of the content of the tasks, the skills, and the knowledge categories.

The information in the objectives is checked against the curriculum outlines and the annotation sheets. Consistency of language from one curriculum objective to another is considered, as is the logic of the scale value progressions.

The final versions can be subjected to still further review by experts. The last essential review is careful proofreading after typing. It is easy for errors to creep in during the various stages of preparation.

PRESENTATION OF MATERIAL

HSMS has presented curriculum development material as follows:

1. A document describing the tasks, the coverage, basic definitions and "desiderata," and presenting the task descriptions and a task index. See, for example, Research Reports Nos. 7 and 9.

2. A document describing the results of the analysis and the job structure and job ladder recommendations. See, for example, Research Report No. 8, Volume 1, and Research Report No. 10.

3. A document presenting the curriculum outlines, the curriculum objectives, and suggestions for program design and/or instructional planning. See, for example, Research Report No. 8, Volume 2.

The curriculum objectives are presented in numerical order. If our earlier suggestions are followed, this means the following:

1. Skill objectives in order of HSMS scale number. Within a skill in rising order of scale value. Within a scale value in preselected order by factor. Within a factor in rising order by job level.

2. Knowledge objectives in order of Knowledge Classification System code number. Within a category in rising order of scale value. Within a scale value in preselected order by factor. Within a factor in rising order by job level.

3. Procedural objectives in preselected order by factor. Within a factor in rising order by job level.

Since the knowledge objectives are presented by knowledge category in the order of their Knowledge Classification System code numbers, we retain the structural relationship among categories; the categories subsumed under broad disciplines appear after their parent disciplines.

Presenting the objectives in order by scale value makes it easy for the program designer or the instructor to compare and/or combine the content of curriculum objectives at the same or different levels, or to anticipate the content at higher levels. Since tasks are scaled for their highest required scale values, lower level behavior required for a given task can be identified by examination of curriculum objectives for lower scale values of the given skill or knowledge category.

CHAPTER 3

PROGRAM DESIGN, INSTRUCTIONAL PLANNING AND CURRICULUM REVIEW

The HSMS curriculum outlines and curriculum objectives can contribute to program design, instructional planning, and may also facilitate a better accommodation of occupational programs to changing job content, technological requirements, and educational mobility. These issues are discussed in this chapter.

PROGRAM DESIGN

The HSMS curriculum outlines can have implications for the sequential arrangement of courses or the assignment of curriculum units to programs. Some are appropriate and others are not. For example, the HSMS curriculum outlines present the skills first, followed by knowledge categories in the code number order of the Knowledge Classification System. This overall sequence is not recommended to program designers. However, within each category, the outlines start with the lowest scale value and proceed upwards. For any given program, sequencing by scale value is the most logical way to present any given skill or knowledge category. It is also appropriate to present a broad subject category before its component subdivisions. The outlines take this into account, and thereby assist the program designer with such sequencing.

We believe that it is certainly not appropriate to teach skills first and knowledge categories later. (See the section on skills

under Instructional Planning, below.) It is preferable to teach skills together with the knowledge content to which they are applied.

The overall order in which knowledge categories appear within the HSMS Knowledge Classification System may also not be the most appropriate order for a given occupational program. The sub-categories within broad disciplines have a clear interrelationship reflecting the structure of the disciplines; however, it is an arbitrary function of the Knowledge System coding that the biological sciences come before physics or mathematics, that "normal structure and function" and "pathology" come before "pharmacology," or that these precede "diagnostic radiology" or "interaction with radiation." It was an arbitrary decision that placed the "musculoskeletal system" after several other systems of the body under "normal structure and function."

One insight that we offer is that the skills and knowledges that "determine" a given factor are interrelated, and generally rise and fall together. Those which determine a given factor should be considered for joint presentation. There is a possibility that, since they are interrelated, presenting the material together may enhance the effectiveness of instruction.

In examining the three imaging technologies we concluded that it is a waste of effort to teach "topographic anatomy," "regional anatomy," or the anatomy and physiology of various systems of the body separately from "positioning." This type of separation of course work can be found in current program outlines. It cannot be rectified unless the decision to combine the subjects is made at the level of pro-

gram design. The HSMS method and results can pinpoint similar issues as the analysis is carried out.

As a general rule, skill and knowledge objectives that relate to the same task activities should be grouped together and taught as a unit. Introduction to the disciplines and skills should come first, followed by the specific content of the disciplines as required in the task situations covered by the occupational-educational unit. Laboratory simulation would follow, and then, eventually, clinical practice.

Sets of HSMS curriculum objectives could be organized into three or four modules which would cover, in sequential fashion, the general academic, laboratory, and clinical content needed to master a particular group of task activities. This approach is valuable for program designers who are preparing modular program structures.

The benefit of this type of task-centered program design is that it is possible to provide the student with an early awareness of how the various disciplines are combined in the clinical situation.

INSTRUCTIONAL PLANNING

HSMS is able to offer suggestions for instructional planning because the skill scales, the Knowledge Classification System, and the task descriptions have instructional implications. We offer suggestions in three areas: first, in the use of task descriptions; second, a somewhat new approach to the teaching of skills; and third, some specific suggestions for the classroom presentation of certain of the skills.

Task Descriptions as Instructional Materials

The HSMS task descriptions function as a source of procedural knowledge: the procedures and sequences for the individual tasks. As instructional materials for the classroom and for clinical training, they provide ordered, logical sequences of steps. They suggest what contingencies, options, and emergencies are associated with the tasks, and, for the less familiar specialties, an indication of what is done in a given procedure.

The task descriptions themselves provide textual materials that are lacking in certain fields. For example, we found few technologist-level textbooks which describe clinical procedures in a consistent format, in appropriate sequences, and with reference to contingencies for radiation therapy. Little sequential or detailed information exists for many radiographic contrast studies, particularly angiography.

The task descriptions portray the clinical experience, including what is used and the interactions among personnel that occur. As a result, they can be used in the development of team training. For any given occupational level, such as radiologic technology, the task descriptions for higher-level jobs, such as physicist and radiologist, can be used to provide students with an understanding of the work behavior to be expected of these members of the team.

Teaching the Skills

The HSMS curriculum objectives are primarily skill objectives and knowledge objectives. A skill, as defined in the HSMS method, is displayed when an individual carries out a mental or physical activity. Detailed information and comprehension of the theory of specific disciplines or subject areas, and information on how things function, how to use them, or what to do, is knowledge. Applying or using knowledge in a job task requires skills.

Skills require practice if they are to be learned; skill is the basic component in what one learns through "experience." Actual learning of skills takes place only when there is practice. However, conscious awareness of the nature of a skill may facilitate learning. We suggest that skills should be taught directly and consciously, and that their salient characteristics should be explicitly presented. In health services the critical skills deal with personal interaction, decision making, and cognitive processes; they are exercised in the application of knowledge, and are the basis of judgment, problem solving, and evaluation.

While entire courses of study could be required in the hope that these skills are somehow acquired by students, much could be done to ensure their rapid acquisition within the instructional and clinical setting by teaching them purposefully.

J. P. Guilford advocates the conscious development of the intellectual skills on the part of the educator, and suggests that,

"The choice of curriculum should give attention to opportunities that different courses and subject matters have for development of the general skills as well as for their more immediate and special utilities." [1] He indicates the value of teaching skills directly through practice and in connection with the knowledges to be applied.[2]

We assume that when skills are taught and learned what is transferable are the attributes of the skills (as described in the HSMS scales). This is independent of substantive content. However, while skills can be taught and learned regardless of which specific procedures or knowledges are used to constitute the substantive content when the skill is applied, no skill can be learned without some substantive content. The implication is that what must be taught in each new situation are the knowledges and procedures of the situation. The skill, once learned at a given scale value, is available to the learner for use at that level in another context.

We assume that, all other things being equal, a student who has been able to master a task using scale value 3.5 for a given skill, has less to learn for a second task which also requires scale value 3.5 for the skill than does someone who has never learned to perform at level 3.5 for the skill in any context. These different contexts are the obvious substantive content which should be used to teach the skills.

Instruction can be specifically geared to draw on the interrelationships of skills and knowledge, and can utilize the different

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[1] J. P. Guilford, The Nature of Human Intelligence, New York: McGraw-Hill Book Co., 1967, p. 475.

[2] Op. cit., p. 476.

knowledge areas to specifically develop the skills. The skills can be used to develop the understanding of the knowledge. If instructional planning emphasizes the direct teaching of skills as well as knowledge, needlessly long and unduly inadequate training might be eliminated to an extent not yet imagined.

The direct teaching of skills and the link in curriculum objectives between skills and task activities may make it possible to provide students with the quality training needed to improve the health care delivered to the patients served by the occupations being studied.

Notes on Teaching Specific Skills

The HSMS method includes two interpersonal skills. One is "Human Interaction." It is exercised whenever a task requires the performer to come into contact or interact with other persons. The second, "Leadership," is exercised whenever a task requires the performer to relate to subordinates so as to influence their work behavior. Both of these scales have scaling principles which describe the circumstances under which the skills must be exercised, rather than the nature of the skills. This is because interpersonal skills may be exercised in ways which are unique to the performer and reflect his or her individual personality. These skills can be taught independently of individual personality differences by teaching the circumstances that require them and the outcomes that are required.

The interpersonal skills may best be taught by combining direct experiential techniques, such as role playing and sensitivity

training, with didactic emphasis on the task circumstances that call for the skills. For example, human interaction involves awareness of the "relevant characteristics" of the "other" in the task. What these characteristics are varies with the task and must be consciously taught. Similarly, the task conditions which require various degrees of leadership may vary from institution to institution. Instruction must cover how to assess the conditions that require different levels of leadership.

The scaling of tasks for Financial Consequences of Error and Consequences of Error to Humans is based on an assessment of the most serious likely errors to be expected after adequate training has taken place. In teaching these "responsibility" skills, however, pre-training, in-training, and post-training errors should be taught, and emphasis should be placed on the avoidance of all error as well as on the consequences of error.

CURRICULUM REVIEW

The HSMS curriculum objectives state specific learning outcomes in behavioral language. They can supply a common frame of reference for review of curricula, for arriving at a basis for granting credit for advanced standing, and to make possible the articulation of programs. This section touches on some possibilities for curriculum change, curriculum comparison, and analysis of core curriculum requirements.

Curriculum Change

Educational programs are under pressure to change in order to accommodate socially engendered requirements such as treating the patient with dignity, arranging for informed consent, and providing maximum safety; they are under pressure to change in order to accommodate new technologies or to make possible the practice of holistic health care by treating the patient as a whole person, i.e., as an entity with body, mind, feelings, and, for some, spirit.

Change is necessary if the graduates of occupational programs are to perform appropriately in the institutions which hire them and if they are to fill the health care needs of a changing society.

The HSMS method of job analysis, job ladder design, and curriculum design makes possible an ongoing accommodation to changes in occupational content. Regardless of the source of change, the results can be translated as follows:

1. Writing new task descriptions.
2. Changing existing task descriptions.
3. Eliminating obsolete task descriptions.
4. Changing skill and knowledge requirements for tasks; skill and knowledge scaling of new tasks.

The HSMS methods make it possible to incorporate any such changes into the task data base. This means that the new or changed task descriptions can be located in factors and in task hierarchies through inspection and/or statistical analysis. This, in turn, means

that new or changed tasks can be assigned to the jobs or occupations where any additional preparation required to teach their performance would be at a minimum.

New tasks can readily be incorporated into curriculum outlines and curriculum objectives, including, if appropriate, the specification of new educational objectives and the creation of new curriculum objectives. A similar approach can be taken to change or remove from curricula the objectives associated with obsolete tasks.

Comparison of Curriculum Content

Chapter 4 of Working Paper No. 11 describes ways in which HSMS curriculum objectives can be used to compare existing curricula to identify overlap of content across programs, to find unnecessary requirements, and to pinpoint areas not adequately covered. It describes how to use the HSMS curriculum objectives to provide for articulation of programs through granting credits, advanced standing and/or exemptions for students who move from one program to another.

The curriculum objectives provide concrete references about what the given curricula do or do not teach the student to do. They can be used as a common frame of reference to compare one set of curriculum requirements with another. In these undertakings the curriculum objectives help the educator to pinpoint the content and outcomes of course material.

Core Curriculum

The concept of core curriculum has had some popularity in educational planning for health occupations. However, the term appears to have been used in a variety of ways. To many, it has been thought of as a way of designing educational ladders. By providing the same curriculum content to students preparing for many different occupations, it has been considered a way to reduce overlap. That is, by designing overlap into various core course requirements, repetition of the same offering would not be needed for persons moving across the various programs. This approach does not require that all students receive their core training before they take other work; it only specifies common areas. The only drawback to this approach is when it is applied without critical review of the relevance of the material. The assumption that specific subject areas should be taught in the same way and cover the same material for varying occupations is sometimes made from an armchair distance, and has at times led to core offerings which, in fact, were useless to most of those concerned and simply wasted time.

Another approach to core curriculum has been to provide a set of general or basic orientation courses to be taken in common by all students in health related programs in the first semesters or first stages of education. Specialization in the various individual programs follows. This approach provides a common setting for all beginning students, but is justifiable only if it can be shown that the courses in the core are useful for all the occupations, can be taught in the same classroom to students preparing for varying occupations, and do not have to be repeated later in their specific applications.

The HSMS task data and curriculum objectives can provide the basis for analyzing whether there is virtue in providing core offerings in given occupational programs. Once several service areas are studied, analysis of the HSMS curriculum objectives can show whether programs can share "core" overlap. The following discussion of our findings for Research Report No. 10 is offered as an example of the type of analysis that can be done.

The possibility of core courses was examined and reported in Research Report No. 10. We asked:

> Would it be appropriate to offer core courses which would serve all three technologist programs in diagnostic radiology, ultrasound, and radiation therapy?

We first calculated an index of task difficulty by considering the number of skill and knowledge categories and the scale value at which each is required for each task in each technologist occupational-educational unit. These "point scores" were averaged and compared as point score indexes across the three job structures.[3]

As Figure 10, below, indicates, we found that diagnostic radiography technology requires 66 separate skill and knowledge categories, but has the lowest point score average of the three technologist job structures (even though ultrasound technology requires fewer skill and knowledge categories). The largest number of categories and the highest point score is required for radiation therapy technology.

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[3] A description of how to calculate "point scores" using the MATRIX arrays is presented in Volume 3 of this report.

These figures suggested that the three occupational-educational units are probably different from one another in significant ways.

Figure 10. COMPARISON OF POINT SCORE AVERAGES AT LEVEL 3

Technologist	No. of Tasks*	No of S & K Categories	Point Score Average
Diagnostic Radiography	73	66	64.3
Diagnostic Ultrasound	14	60	73.8
Radiation Therapy	32	81	75.6

*Excludes Task 280. Source: Research Report No. 10.

Figure 11 presents the results of our comparison of radiologic technologist requirements with ultrasound requirements and with radiation therapy requirements. In each case we took the highest scale value at which an occupational-educational unit requires a skill or knowledge category and compared requirements. We asked, which are required at the same scale value, which higher, which lower, and which categories are uniquely required by the occupational-educational unit for the specialty?

As Figure 11 indicates, radiologic technology shares only seven skills and eight knowledge categories at the same scale value with the diagnostic ultrasound technologist, but nine skills and 21 knowledge categories (almost half its requirements) with the radiation therapy technologist. There are 20 skill and knowledge categories needed at lower scale values for radiologic technology than needed for radiation therapy, and 22 needed at lower scale values for radiologic technology than needed for ultrasound technology. There are seven and eight categories needed by radiologic technology at higher scale levels than for the other two jobs, respectively.

Figure 11. COMPARISON OF LEVEL 3 TECHNOLOGIST CURRICULUM REQUIREMENTS

Radiologic Technology and Ultrasound Technology	
Skill and knowledge categories in common at same (highest) scale value[a]:	15
Skill and knowledge categories needed at higher scale value for radiography:	8
Skill and knowledge categories needed at higher scale value for ultrasound:	22
Skill and knowledge categories required only for radiography:	20
Skill and knowledge categories required only for ultrasound:	15
Radiologic Technology and Radiation Therapy Technology	
Skill and knowledge categories in common at (highest) scale value[b]:	30
Skill and knowledge categories needed at higher scale value for radiography:	7
Skill and knowledge categories needed at higher scale value for radiation therapy:	20
Skill and knowledge categories required only for radiography:	8
Skill and knowledge categories required only for radiation therapy:	24

[a] Categories in common at the same (highest) scale values include seven skills, normal structure and function, regional and topographic anatomy, shock and trauma, operative procedures, delivery methods for childbirth, first aid, and handling and transportation of the sick or wounded.

[b] Categories in common at same (highest) scale values include nine skills, regional and topographic anatomy, the anatomy and physiology of the organs of the stomach, small intestine, large intestine and biliary system, and eye, disorders affecting the circulatory system, respiratory system, musculoskeletal system, shock and trauma, surgery, operative and introductory procedures, anesthesiology, first aid, bandages and dressings, handling and transportation of the sick, drug idiosyncrasy, death and dying behavioral development, algebra, and the mechanics of writing English.

Source: Appendix D, Table 9 in Research Report No. 10.

Fifteen separate categories are needed for ultrasound which are not needed for radiologic technology, while 24 are needed only for radiation therapy. On the other hand, radiologic technology requires 20 categories not required for ultrasound and eight not needed for radiation therapy. We therefore concluded the following:

1. There is no reason to make any technologist program a prerequisite for any other technologist program. The three sets of requirements have enough in common to indicate that there would be a good deal of redundancy if such a sequence were required, but the three sets of requirements are different enough to make it a waste of time for an individual to have to master any two technologies in order to practice one of them.

2. There is reason to consider providing a substantial amount of exemption with credit or advanced standing for radiologic technologists who wish to study to become radiation therapy technologists and some amount of exemption or advanced standing for radiologic technologists who wish to study to become diagnostic ultrasound technologists. The credit should cover common areas.

3. It would be appropriate to offer core courses in the early part of programs for the three technologies. Such core courses could include curriculum objectives covering regional and topographic anatomy, shock and trauma, operative procedures, first aid, and handling and transportation of the sick or wounded.

FINAL NOTE

There is a growing sentiment at large among educators, health practitioners, and the general public for the preparation of "healing educators" rather than narrow health technicians and specialists. This sentiment will grow stronger as the American public moves to demand better, cheaper, and more personal health care, as well as more of a share in the healing process.

Students in fields as different as medical laboratory technology and physical therapy are asking for training in how to deal with people, especially the aging, the chronically ill, the cancer-ridden, and the emotionally disturbed. They want to give caring and healing contact as well as technical skills; and they want to actively influence health policy.

We at HSMS believe that the HSMS analysis of tasks and design of curricula are able to reflect these needs and desires. They can all be translated into task descriptions, skill or knowledge requirements, and curriculum objectives. We sincerely hope that the method will be put to use to serve such purposes.

APPENDIXES

A. CURRICULUM OBJECTIVE PROTOTYPES A-1

B. SCALING SHEETS AND ANNOTATION SHEETS FOR FIVE TASKS B-1

C. EXAMPLES OF CURRICULUM OUTLINES C-1

D. EXAMPLES OF HSMS CURRICULUM OBJECTIVES D-1

APPENDIX A

CURRICULUM OBJECTIVE PROTOTYPES

Locomotion Skills	A-1
Object Manipulation Skills	A-2
Guiding or Steering Skills-A	A-3
Guiding or Steering Skills-B	A-4
Human Interaction Skills	A-5
Leadership Skills	A-6
Oral Use of a Relevant Language	A-7
Reading Use of a Relevant Language	A-8
Written Use of a Relevant Language	A-9
Decision Making on Methods	A-10
Decision Making on Quality	A-11
Figural Skills	A-12
Symbolic Skills	A-13
Taxonomic Skills-A	A-14
Taxonomic Skills-B	A-15
Implicative Skills	A-16
Financial Consequences of Error	A-17
Consequences of Error to Humans	A-18
Knowledge Objective	A-19
Procedural Objective	A-20

LOCOMOTION SKILLS PROTOTYPE

CURRICULUM OBJECTIVE SHEET Page 1 of

Type of Objective Skill Factor No.

Skill or Knowledge Category Locomotion Skills Scale Value

Occupation Level

Refers to Task Code No(s).:

Is there Cross Reference? ...Yes(X) ...No( ) If yes, see footnote(s).

Content: A graduate of the program at this educational level must be able to coordinate his or her movements of body, torso, or limbs through space to achieve the standards set for body movement or pos tion in the following activities:

[Insert numbered statements using task description language followed by the relevant Task Code Numbers.]

To accomplish this, the student must be able to state what standards of motion or position must be achieved for each activity, and must be able to exercise the degree of coordination necessary to achieve the standards.

Cross Reference Footnotes: See The Following Curriculum Objectives:
Lower scale value appears in:
Same scale value appears in:
Higher scale value appears in :

OBJECT MANIPULATION SKILLS PROTOTYPE

CURRICULUM OBJECTIVE SHEET Page 1 of

Type of Objective Skill Factor ____ No. ____
Skill or Knowledge Category Object Manipulation Skills Scale Value ____
Occupation ____ Level ____
Refers to Task Code No(s).: ____

Is there Cross Reference? ...Yes(X) ...No( ) If yes, see footnote(s).

Content: A graduate of the program at this educational level must be able to achieve the degree of control and precision in the manipulation of objects with the fingers, hands, or limbs with the fineness of motion appropriate to achieving the standards set for manipulation of objects in the following activities:

[Insert numbered statements using task description language followed by the relevant Task Code Numbers.]

To accomplish this, the student must be able to state what standards of precision must be achieved for each activity, and must be able to exercise the degree of control and precision necessary to achieve the standards.

Cross Reference Footnotes: See The Following Curriculum Objectives:
Lower scale value appears in:
Same scale value appears in:
Higher scale value appears in:

GUIDING OR STEERING SKILLS PROTOTYPE A

CURRICULUM OBJECTIVE SHEET Page 1 of

Type of Objective Skill Factor No.
Skill or Knowledge Category Guiding or Steering Skills Scale Value
Occupation Level
Refers to Task Code No(s).:

Is there Cross Reference? ...Yes(X) ...No( ) If yes, see footnote(s).

Content: A graduate of the program at this educational level must be able to coordinate his or her perception of external stimuli which inform him or her of his or her position in order to control an object being moved over a predetermined pathway in the following activities so as to achieve the degree of precision necessary to accomplish the objective within an acceptable margin of error:

[Insert numbered statements using task description language followed by the relevant Task Code Numbers.]

To accomplish this, the student must be able to state what external stimuli must be attended to, what coordination is required, and what margin of error is allowable in the movement of the object to achieve the standards.

[Make sure that prototype A is appropriate, rather than prototype B.]

Cross Reference Footnotes: See The Following Curriculum Objectives:
Lower scale value appears in:
Same scale value appears in:
Higher scale value appears in:

GUIDING OR STEERING SKILLS PROTOTYPE B

CURRICULUM OBJECTIVE SHEET Page 1 of

Type of Objective Skill Factor ____ No. ____
Skill or Knowledge Category Guiding or Steering Skills Scale Value ____
Occupation ____ Level ____
Refers to Task Code No(s).: ____

Is there Cross Reference? ...Yes(X) ...No( ) If yes, see footnote(s).

Content: A graduate of the program at this educational level must be able to coordinate his or her perception of external stimuli which inform him or her of his or her position in order to control an object held steady on a moving target in the following activities so as to achieve the degree of precision necessary to accomplish the objective within an acceptable margin of error:

[Insert numbered statements using task description language followed by the relevant Task Code Numbers.]

To accomplish this, the student must be able to state what external stimuli must be attended to, what coordination is required, and what margin of error is allowable in the holding on the moving target to achieve the standards.

[Make sure that prototype B is appropriate, rather than prototype A.]

Cross Reference Footnotes: See The Following Curriculum Objectives:
Lower scale value appears in:
Same scale value appears in:
Higher scale value appears in:

HUMAN INTERACTION SKILLS PROTOTYPE

CURRICULUM OBJECTIVE SHEET Page 1 of

Type of Objective Skill Factor No.
Skill or Knowledge Category Human Interaction Skills Scale Value
Occupation Level
Refers to Task Code No(s).:

Is there Cross Reference? ...Yes(X) ...No( ) If yes, see footnote(s).

Content: A graduate of the program at this educational level must be able to exercise sensitivity to others, and be sufficiently perceptive of the relevant characteristics or state of being of other people in the following activities to be able to pay attention to feedback in interaction, and adjust his or her behavior as appropriate to accomplish the purpose of the tasks in which the interactions occur. These activities include:

[Insert numbered statements using task description language followed by the relevant Task Code Numbers.]

To accomplish this, the student must be able to demonstrate sufficient awareness of what the relevant characteristics are of the "other" in the given situation, must be able to demonstrate sufficient perception of the feedback from the "other," and must be able to indicate what the proper adjustment must be in his or her behavior to accomplish the activities which engendered the interaction, and do this at the quality standard set.

Cross Reference Footnotes: See The Following Curriculum Objectives:
Lower scale value appears in:
Same scale value appears in:
Higher scale value appears in:

LEADERSHIP SKILLS PROTOTYPE

CURRICULUM OBJECTIVE SHEET Page 1 of

Type of Objective Skill Factor No.
Skill or Knowledge Category Leadership Skills Scale Value
Occupation Level
Refers to Task Code No(s).:

Is there Cross Reference? ...Yes(X) ...No( ) If yes, see footnote(s).

Content: A graduate of the program at this educational level must be able to indicate the extent to which he or she is called on to provide leadership to subordinates (in line relation or de facto) so as to influence their work behavior, in order to accomplish work objectives such as the following:

[Insert numbered statements using task description language followed by the relevant Task Code Numbers.]

To accomplish this, the student must be able to state what power he or she has over the subordinates' conditions of employment (hiring, firing, promotions, raises, transfers, overtime, special privileges) in this situation; indicate how less leadership is needed the greater the power; and state what can be done to reduce or increase the need for leadership.

The student must be able to state what channels of communication exist for giving orders in this situation, for receiving or giving information, for the evaluation of and for exercising discipline over the subordinates; indicate how less leadership is needed the more precisely known and formalized these channels are; and state what can be done to reduce or increase the need for leadership.

The student must be able to state the degree to which the tasks of subordinates which are to be accomplished are clearly defined and understood by the subordinates in this situation; indicate how less leadership is needed the clearer the subordinates' own tasks are to them; and state what can be done to reduce or increase the need for leadership.

Cross Reference Footnotes: See The Following Curriculum Objectives:
Lower scale value appears in:
Same scale value appears in:
Higher scale value appears in:

ORAL USE OF A RELEVANT LANGUAGE PROTOTYPE

CURRICULUM OBJECTIVE SHEET Page 1 of

Type of Objective Skill Factor No.
Skill or Knowledge Category Oral Use of a Relevant Language Scale Value
Occupation Level
Refers to Task Code No(s).:

Is there Cross Reference? ...Yes(X) ...No( ) If yes, see footnote(s).

Content: A graduate of the program at this educational level must be able to communicate orally (in an appropriate language) and comprehend what is said in that language with a sufficient degree of precision to accomplish the following activities by expressing or comprehending meaning with the degree of precision needed:

[Insert numbered statements using task description language followed by the relevant Task Code Numbers.]

To accomplish this, the student must be able to deal with the nuances of oral language with sufficient precision to use the words needed correctly in context, or grasp the meaning (or question a speaker about intended meaning), so that the activities involved can be accomplished satisfactorily.

Cross Reference Footnotes: See The Following Curriculum Objectives:
Lower scale value appears in:
Same scale value appears in:
Higher scale value appears in:

READING USE OF A RELEVANT LANGUAGE PROTOTYPE

CURRICULUM OBJECTIVE SHEET Page 1 of

Type of Objective Skill Factor _____ No. _____

Skill or Knowledge Category Reading Use of a Relevant Language Scale Value ____

Occupation _____ Level ____

Refers to Task Code No(s).: _____

Is there Cross Reference? ...Yes(X) ...No( ) If yes, see footnote(s).

Content: A graduate of the program at this educational level must be able to read and comprehend the meaning of any printed or written material (in an appropriate language) with a sufficient degree of precision to accomplish the following activities, based on the preciseness of comprehension of the materials read:

[Insert numbered statements using task description language followed by the relevant Task Code Numbers.]

Cross Reference Footnotes: See The Following Curriculum Objectives:

Lower scale value appears in:

Same scale value appears in:

Higher scale value appears in:

WRITTEN USE OF A RELEVANT LANGUAGE PROTOTYPE

CURRICULUM OBJECTIVE SHEET Page 1 of

Type of Objective Skill Factor ____ No. ____
Skill or Knowledge Category Written Use of a Relevant Language Scale Value ____
Occupation ____ Level ____
Refers to Task Code No(s).: ____

Is there Cross Reference? ...Yes(X) ...No( ) If yes, see footnote(s).

Content: A graduate of the program at this educational level must be able to convey meaning by writing or dictating (in an appropriate language) with a sufficient degree of precision in the words, sentences, and/or paragraphs formed to accomplish the following activities, based on the clarity of meaning conveyed in the materials written or dictated:

[Insert numbered statements using task description language followed by the relevant Task Code Numbers.]

Cross Reference Footnotes: See The Following Curriculum Objectives:
Lower scale value appears in:
Same scale value appears in:
Higher scale value appears in:

DECISION MAKING ON METHODS PROTOTYPE

CURRICULUM OBJECTIVE SHEET Page 1 of

Type of Objective Skill Factor ____ No. ____
Skill or Knowledge Category Decision Making on Methods Scale Value ____
Occupation ____ Level ____
Refers to Task Code No(s).: ____

Is there Cross Reference? ...Yes(X) ...No( ) If yes, see footnote(s).

Content: A graduate of the program at this educational level must be able to carry out the responsibility of exercising a choice over how to carry out the following task activities by choosing the appropriate options regarding what to do, what to use, or how to do the activities as appropriate to the instances of the tasks as they present themselves, and within the guidelines provided for making the choice. The tasks or activities in which this skill must be exercised are as follows:

[Insert numbered statements using task description language followed by the relevant Task Code Numbers.]

To accomplish appropriate decision making on methods the student must be able to indicate the variety of situations likely to occur which would require making the choices, must be able to specify the choices available, and must be able to state what appropriate guidelines there are in order to accomplish the tasks successfully. The student should be able to list the choices, their indications for use and their contraindications, and must be able to provide justifications for the choices.

Cross Reference Footnotes: See The Following Curriculum Objectives:
Lower scale value appears in:
Same scale value appears in:
Higher scale value appears in:

DECISION MAKING ON QUALITY PROTOTYPE

CURRICULUM OBJECTIVE SHEET Page 1 of

Type of Objective Skill Factor ____ No. ____
Skill or Knowledge Category Decision Making on Quality Scale Value ____
Occupation ____ Level ____
Refers to Task Code No(s).: ____

Is there Cross Reference? ...Yes(X) ...No( ) If yes, see footnote(s).

Content: A graduate of the program at this educational level must be able to carry out the responsibility of exercising control over the quality of his or her task performance in the area of latitude provided between minimum standards and the highest possible quality that can be achieved. Activities in which this skill must be exercised are as follows:

[Insert numbered statements using task description language followed by the relevant Task Code Numbers.]

To accomplish appropriate decision making on quality the student must be able to indicate the minimum standards for acceptable performance of the tasks or for the outputs of the tasks, must be able to indicate what latitude above the minimum standards is available to the performer to improve the quality, and must be able to indicate what priorities should be used to exercise judgment on when and where to exceed minimum standards of quality.

Cross Reference Footnotes: See The Following Curriculum Objectives:
Lower scale value appears in:
Same scale value appears in:
Higher scale value appears in:

FIGURAL SKILLS PROTOTYPE

CURRICULUM OBJECTIVE SHEET Page 1 of

Type of Objective Skill Factor ____ No. ____
Skill or Knowledge Category Figural Skills Scale Value ____
Occupation ____ Level ____
Refers to Task Code No(s).: ____

Is there Cross Reference? ...Yes(X) ...No( ) If yes, see footnote(s).

Content: A graduate of the program at this educational level must be able to mentally manipulate (with or without physically manipulating) the figural aspects of objects in terms of size, shape, form, density, arrangement in space, in static array or in motion, to achieve the predetermined figural standards or objectives of size, shape, form, density, or arrangement in the following activities:

[Insert numbered statements using task description language followed by the relevant Task Code Numbers.]

To accomplish this, the student must be able to state what figural standards must be achieved for each activity, and must be able to exercise the degree of figural mental precision necessary to achieve the standards.

Cross Reference Footnotes: See The Following Curriculum Objectives:
Lower scale value appears in:
Same scale value appears in:
Higher scale value appears in:

SYMBOLIC SKILLS PROTOTYPE

CURRICULUM OBJECTIVE SHEET Page 1 of

Type of Objective Skill Factor ____ No. ____
Skill or Knowledge Category Symbolic Skills Scale Value ____
Occupation ____ Level ____
Refers to Task Code No(s).: ____

Is there Cross Reference? ...Yes(X) ...No( ) If yes, see footnote(s).

Content: A graduate of the program at this educational level must be able to mentally manipulate and/or use symbols which are part of an abstract, non-representational system of notation where the symbols stand for properties, relationships, or operations in the following activities:

[Insert numbered statements using task description language followed by the relevant Task Code Numbers.]

To accomplish this, the student must be able to indicate what each symbol represents, must be able to manipulate each as required, and be sufficiently accurate to meet the standards for the activities.

Cross Reference Footnotes: See The Following Curriculum Objectives:
Lower scale value appears in:
Same scale value appears in:
Higher scale value appears in:

TAXONOMIC SKILLS PROTOTYPE A

CURRICULUM OBJECTIVE SHEET Page 1 of

Type of Objective Skill Factor No.
Skill or Knowledge Category Taxonomic Skills Scale Value
Occupation Level
Refers to Task Code No(s).:

Is there Cross Reference? ...Yes(X) ...No( ) If yes, see footnote(s).

Content: A graduate of the program at this educational level must be able to consciously apply conceptual classifying or organizing principles to suit the needs of the following activities:

[Insert numbered statements using task description language followed by the relevant Task Code Numbers.]

To accomplish this, the student must be able to indicate what existing principles of classification or organization are appropriate to the situations, of the tasks, and must indicate how they must be applied to suit the needs of the situations acceptably.

[Make sure that prototype A is appropriate, rather than prototype B.]

Cross Reference Footnotes: See The Following Curriculum Objectives:
Lower scale value appears in:
Same scale value appears in:
Higher scale value appears in:

TAXONOMIC SKILLS PROTOTYPE B

CURRICULUM OBJECTIVE SHEET Page 1 of

Type of Objective Skills Factor ____ No. ____

Skill or Knowledge Category Taxonomic Skills Scale Value ____

Occupation ____ Level ____

Refers to Task Code No(s).: ____

Is there Cross Reference? ...Yes(X) ...No( ) If yes, see footnote(s).

Content: A graduate of the program at this educational level must be able to consciously create conceptual classifying or organizing principles to suit the needs of the following activities:

[Insert numbered statements using task description language followed by the relevant Task Code Numbers.]

To accomplish this, the student must be able to indicate what the needs of the task situation(s) require as criteria for the creation of classifying or organizing principles, and must indicate how this should be accomplished in the situation(s) for successful performance.

[Make sure that prototype B is appropriate, rather than prototype A.]

Cross Reference Footnotes: See The Following Curriculum Objectives:
Lower scale value appears in:
Same scale value appears in:
Higher scale value appears in:

IMPLICATIVE SKILLS PROTOTYPE

CURRICULUM OBJECTIVE SHEET Page 1 of

Type of Objective Skill Factor No.

Skill or Knowledge Category Implicative Skills Scale Value

Occupation Level

Refers to Task Code No(s).:

Is there Cross Reference? ...Yes(X) ...No( ) If yes, see footnote(s).

Content: A graduate of the program at this educational level must be able to come to conclusions, draw implications, or foresee consequences based on information in order to carry out the following activities:

[Insert numbered statements using task description language followed by the relevant Task Code Numbers.]

To accomplish this, the student must be able to indicate the types of information from which he or she must draw in the various instances of the activity which may arise, and must be able to indicate what inferences, consequences, or conclusions are implied by various possible combinations of information as appropriate for the situations. The student should be able to defend the implications drawn using appropriate criteria.

Cross Reference Footnotes: See The Following Curriculum Objectives:

Lower scale value appears in:

Same scale value appears in:

Higher scale value appears in:

FINANCIAL CONSEQUENCES OF ERROR PROTOTYPE

CURRICULUM OBJECTIVE SHEET Page 1 of

Type of Objective Skill Factor ____ No. ____
Skill or Knowledge Category Financial Consequences of Error Scale Value ____
Occupation ____ Level ____
Refers to Task Code No(s).: ____

Is there Cross Reference? ...Yes(X) ...No( ) If yes, see footnote(s).

Content: A graduate of the program at this educational level must be able to display an appropriate awareness of the financial consequences which can result from errors, even after proper training, in the performance of the following tasks:

[Insert numbered abbreviated task names
of each task represented in this objective
followed by the Task Code Number of each.]

To accomplish this, the student must be able to indicate the financial value of the output, equipment, materials, or time involved in the tasks. The student should be able to indicate what the most obvious errors during learning would be, the most serious likely error after proper training has been accomplished, what the financial consequences would be; should be able to state what should be done to avoid the errors; and should be able to carry this out.

Cross Reference Footnotes: See The Following Curriculum Objectives:
Lower scale value appears in:
Same scale value appears in:
Higher scale value appears in:

CONSEQUENCES OF ERROR TO HUMANS PROTOTYPE

CURRICULUM OBJECTIVE SHEET Page 1 of

Type of Objective Skill Factor No.
Skill or Knowledge Category Consequences of Error to Humans Scale Value
Occupation Level
Refers to Task Code No(s).:

Is there Cross Reference? ...Yes(X) ...No( ) If yes, see footnote(s).

Content: A graduate of the program at this educational level must be able to display an appropriate awareness of what harm can be done to self, patients, co-workers, or society as a whole, as a result of errors, even after proper training, in the performance of the following tasks:

[Insert numbered abbreviated task names of each task represented in this objective followed by the Task Code Number of each.]

To accomplish this, the student must be able to indicate the harm that can be done to humans at every point in the steps of the task. The student should be able to indicate what the most obvious errors during learning would be, the most serious likely error after proper training has been accomplished, what the consequences for humans would be; should be able to state what should be done to avoid error(s); and should be able to carry this out.

Cross Reference Footnotes: See The Following Curriculum Objectives:
Lower scale value appears in:
Same scale value appears in:
Higher scale value appears in:

KNOWLEDGE OBJECTIVE PROTOTYPE

CURRICULUM OBJECTIVE SHEET Page 1 of

Type of Objective Knowledge Factor ____ No. ____
Skill or Knowledge Category [Insert Knowledge System Code No.] Scale Value ____
Occupation ____ Level ____
Refers to Task Code No(s).: ____

Is there Cross Reference? ...Yes(X) ...No( ) If yes, see footnote(s).

Content: A graduate of the program at this educational level must be able to demonstrate mastery of the following subject area

[Insert full name of Knowledge System category and underline.]

at a level of awareness and depth of understanding adequate to the proper performance of the following activities:

[Insert numbered statements using task description language followed by the relevant Task Code Numbers.]

To accomplish these activities the student must have a detailed knowledge of the subject category, covering the appropriate technical or special terms, facts, equipment, and/or procedures which are part of this discipline and are required for successful completion of the activities listed above.

Cross Reference Footnotes: See The Following Curriculum Objectives:
Lower scale value appears in:
Same scale value appears in:
Higher scale value appears in:

PROCEDURAL OBJECTIVE PROTOTYPE

CURRICULUM OBJECTIVE SHEET Page 1 of

Type of Objective Procedural Factor No.
Skill or Knowledge Category Not Applicable (n.a.) Scale Value
Occupation Level
Refers to Task Code No(s).: Tasks listed below [insert total number]

Is there Cross Reference? ...Yes( ) ...No(X) If yes, see footnote(s).

Content: A graduate of the program at this educational level must be able to demonstrate the following to a degree of proficiency appropriate to the task situation:

1. Demonstrate the proper sequence of events in each of the tasks listed below (all the tasks for this factor at this level).

2. Properly use all the equipment called for in the tasks listed below.

3. Properly apply arithmetic in using symbolic skills and algebra if called for in the tasks listed below. [Delete if not appropriate.]

To accomplish this, the student must be able to (a) list the proper sequence of events in each task; (b) indicate the possible emergencies or variations to be expected in the task situation, and the proper sequence of events for each eventuality; and (c) demonstrate the proper performance of each task in a predetermined clinical setting or in clinical simulation.

[Insert a list of all the Task Code Numbers and abbreviated task names contained in this occupational-educational unit.]

[There is one procedural objective for each occupational-educational unit.]

APPENDIX B

SCALING SHEETS AND ANNOTATION SHEETS FOR FIVE TASKS

Figure		Page
B.1	HSMS Skill Scaling Sheet for Task No. 74.	B-1
B.2	Task Description Sheet for Task 74 Annotated for Skill Scale Values.	B-2
B.3	HSMS Skill Scaling Sheet for Task No. 138.	B-5
B.4	Task Description Sheet for Task 138 Annotated for Skill Scale Values.	B-6
B.5	HSMS Skill Scaling Sheet for Task No. 153.	B-9
B.6	Task Description Sheet for Task 153 Annotated for Skill Scale Values.	B-10
B.7	HSMS Skill Scaling Sheet for Task No. 182.	B-13
B.8	Task Description Sheet for Task 182 Annotated for Skill Scale Values.	B-14
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B.10	Task Description Sheet for Task 533 Annotated for Skill Scale Values.	B-18
B.11	HSMS Knowledge Identification Sheet for Task No. 74.	B-23
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B.15	HSMS Knowledge Identification Sheet for Task No. 153.	B-31
B.16	Task Description Sheet for Task 153 Annotated for Knowledge and Scale Values.	B-32
B.17	HSMS Knowledge Identification Sheet for Task No. 182.	B-35
B.18	Task Description Sheet for Task 182 Annotated for Knowledge and Scale Values.	B-36
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B.20	Task Description Sheet for Task 533 Annotated for Knowledge and Scale Values.	B-40

Figure B.1 HSMS SKILL SCALING SHEET FOR TASK NO. 74

Task Name Explaining to any out-patient or accompanying adult proper at-home procedures to follow prior to coming for radiographic exam. Task Code No. 74

Institution _____ Analysts _____

Scale	Circle Appropriate Scale Value for Each Scale																	
	0	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7	7.5	8	8.5	9
1 Frequency	0	1		2		3		4				6		7		8		9
2 Locomotion	(0)		1.5							5				7				9
3 Object Manipulation	(0)		1.5				3.5			5					7.5			9
4 Guiding or Steering	(0)		1.5			3					5.5			7				9
5 Human Interaction	0	1				(3)				5				7				9
6 Leadership	(0)	1				3			4.5				6.5				8.5	
7 Language: Oral Use	0			2				(4)							7.5			9
Insert name(s) of language(s): English																		
8 Language: Reading Use	0			(2)						5				7				9
Insert name(s) of language(s): English																		
9 Language: Written use	(0)			2						5			6.5					9
Insert name(s) of language(s):																		
10 Decision: Methods	(0)		1.5			3			4.5					7				9
11 Decision: Quality	0		1.5	2			3.5				5.5			(7)				9
12 GIS: Figural	(0)	1					3.5			5				7				9
13 GIS: Symbolic	(0)		1.5				3.5			5				7				9
14 GIS: Taxonomic	(0)			2							5.5			7				9
15 GIS: Implicative	(0)	1		2				4		5						8		9
16 Error: Financial	0	(1)						4				6			7.5			9
Insert error: Not checking that pt. understands : result : loss of time																		
17 Error: Human	0	(1)		2		3					5.5			7		8		9
Insert error: Not checking : result : inconvenience, delay																		

Check here if this is a master sheet . . . (X)

Circle the pre-entered scale value chosen for each scale.

Figure B.2 TASK DESCRIPTION SHEET FOR TASK 74
ANNOTATED FOR SKILL SCALE VALUES

Code 74

P. 141

1. What is the output of this task? (Be sure this is broad enough to be repeatable.)

A patient or accompanying adult reinforced about procedures to follow at home prior to coming for radiographic examination.

2. What is used in performing this task? (Note if only certain items must be used. If there is choice, include everything or the kinds of things chosen among.)

X-ray requisition sheet; written prior preparation orders for patient; instruction sheet on prior preparation

3. Is there a recipient, respondent or co-worker involved in the task? Yes...(X) No...( )

4. If "Yes" to q. 3: Name the kind of recipient, respondent or co-worker involved, with descriptions to indicate the relevant condition; include the kind with whom the performer is not allowed to deal if relevant to knowledge requirements or legal restrictions.

Any out-patient; accompanying adult; receptionist or co-worker

5. Name the task so that the answers to questions 1-4 are reflected. Underline essential words.

Explaining to any out-patient or accompanying adult proper at-home procedures to follow prior to coming for radiographic or fluoroscopic examination, by reading what is required; presenting written instructions; explaining; and checking that patient understands.

Figure B.2 TASK DESCRIPTION SHEET (continued)

Task Code No. 74

This is page 1 of 1 for this task.

List Elements Fully
Performer may be asked to reinforce orders which an out-patient is to or was to have followed at home before certain radiographic examinations as a result of: a. Request. b. Regular assignment. 1. Performer asks what examination is involved and/or reads requisition form to learn what radiographic procedure was ordered and/or orders for any prior preparation for the patient to carry out at home, such as cleansing enema and/or abstinence from food or drink for a given period of time. 2. Performer presents written instructions to patient. Explains carefully to patient what must be done or not done before coming for the next appointment for radiography. Checks to be sure that patient understands, may explain reasons, nature of examination and details of what to do. If appropriate, performer explains to adult accompanying a pediatric patient how to prepare patient. OK-RP;RR;RR
b. Check here if this is a master sheet..(X)

Reading use of language 2.0

Human interaction 3.0

Decision making on Quality 7.0

Oral use of language 4.0

Financial error: not checking that pt. understands, resulting in need for rescheduling 1.0

Human error: same, resulting in need to redo by pt. 1.0

Figure B.3 HSMS SKILL SCALING SHEET FOR TASK NO. 138

Task Name Reporting observed symptoms and concerns of any pt. to physician or staff member Task Code No. 138

Institution _____ Analysts _____

Scale	Circle Appropriate Scale Value for Each Scale																	
	0	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7	7.5	8	8.5	9
1 Frequency	0	1		2		3		4				6		7		8		9
2 Locomotion	(0)		1.5							5				7				9
3 Object Manipulation	(0)		1.5				3.5			5					7.5			9
4 Guiding or Steering	(0)		1.5			3					5.5			7				9
5 Human Interaction	0	1				3				(5)				7				9
6 Leadership	(0)	1				3			4.5				6.5				8.5	
7 Language: Oral Use	0			2				(4)							7.5			9
Insert name(s) of language(s): English																		
8 Language: Reading Use	(0)			2						5				7				9
Insert name(s) of language(s):																		
9 Language: Written use	(0)			2						5			6.5					9
Insert name(s) of language(s):																		
10 Decision: Methods	0		1.5			3			(4.5)					7				9
11 Decision: Quality	0		1.5	2			3.5				5.5			(7)				9
12 GIS: Figural	(0)	1					3.5			5				7				9
13 GIS: Symbolic	(0)		1.5				3.5			5				7				9
14 GIS: Taxonomic	(0)			2							5.5			7				9
15 GIS: Implicative	(0)	1		2				4		5						8		9
16 Error: Financial	0	(1)						4				6			7.5			9
Insert error: Not reporting accurately; resulting in wasted time																		
17 Error: Human	0	1		2		(3)					5.5			7		8		9
Insert error: Not reporting promptly; resulting in delay of attention to pt.																		

Check here if this is a master sheet . . . (X)

Circle the pre-entered scale value chosen for each scale.

Figure B.4 TASK DESCRIPTION SHEET FOR TASK 138
ANNOTATED FOR SKILL SCALE VALUES

Code 138 p. 1of1

1. What is the output of this task? (Be sure this is broad enough to be repeatable.)

Symptoms or concerns of patient indicating health problem observed or discussed and reported to physician or appropriate staff member.

2. What is used in performing this task? (Note if only certain items must be used. If there is choice, include everything or the kinds of things chosen among.)

--

3. Is there a recipient, respondent or co-worker involved in the task? Yes...(X) No...( )

4. If "Yes" to q. 3: Name the kind of recipient, respondent or co-worker involved, with descriptions to indicate the relevant condition; include the kind with whom the performer is not allowed to deal if relevant to knowledge requirements or legal restrictions.

Any patient; physician or staff member

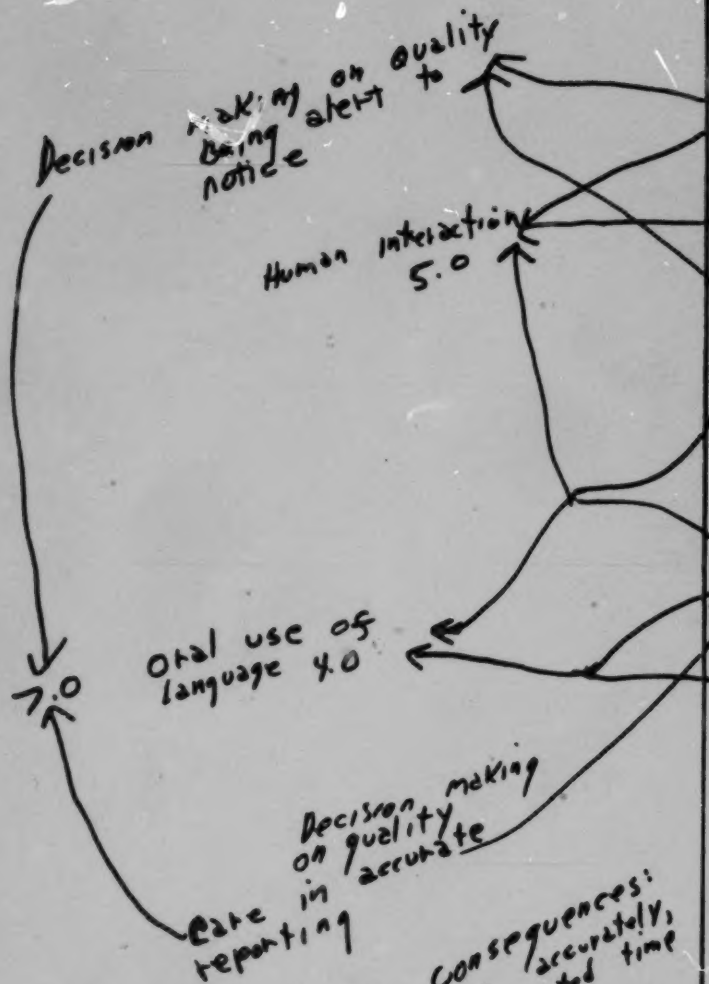
5. Name the task so that the answers to questions 1-4 are reflected. Underline essential words.

Reporting observed symptoms and concerns of any patient to physician or staff member by observing patient's behavior, engaging in conversation; verbally reporting information considered to be helpful for patient's care to physician or appropriate staff member.

Figure B.4 TASK DESCRIPTION SHEET (continued)

Task Code No. 138

This is page 1 of 1 for this task.


Decision making on quality to alert
Decision making on quality accurate
Human interaction 5.0
Oral use of language 4.0
Decision making on methods 4.5
Data reporting
Financial error consequences: not reporting accurately resulting in wasted time 1.0
Human error consequences: not reporting promptly resulting in delay in giving pt. proper attention 3.0

List Elements Fully
Performer must be alert to notice any symptoms or concerns manifested by the patient which should be brought to the attention of physician or staff. 1. As performer interacts with patient before and/or after patient has seen physician, performer notes conditions, symptoms, or behavior which should be brought to physician's attention, such as shortness of breath, sudden weakness, flushing, rash, tremors. 2. Notes whether, in conversation, patient mentions symptoms or worries related to health, or concerns which would indicate information helpful to physician in caring for patient. 3. Reports verbally to physician or appropriate staff member who would relay information. OK-RP;RR;RR
6. Check here if this is a master sheet..(X)

Figure B.5 HSMS SKILL SCALING SHEET FOR TASK NO. 153

Task Name Assisting physician or co-worker in special examination or treatment procedures Task Code No. 153

Institution _____ Analysts _____

Scale	Circle Appropriate Scale Value for Each Scale																	
	0	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7	7.5	8	8.5	9
1 Frequency	0	1		2		3		4				6		7		8		9
2 Locomotion	(0)		1.5							5				7				9
3 Object Manipulation	0		(1.5)				3.5			5					7.5			9
4 Guiding or Steering	(0)		1.5			3					5.5			7				9
5 Human Interaction	0	1				3				(5)				7				9
6 Leadership	(0)	1				3			4.5				6.5				8.5	
7 Language: Oral Use	0			2				(4)							7.5			9
Insert name(s) of language(s): English																		
8 Language: Reading Use	0			(2)						5				7				9
Insert name(s) of language(s): English																		
9 Language: Written use	(0)			2						5			6.5					9
Insert name(s) of language(s):																		
10 Decision: Methods	(0)		1.5			3			4.5					7				9
11 Decision: Quality	0		(1.5)	2			3.5				5.5			7				9
12 GIS: Figural	(0)	1					3.5			5				7				9
13 GIS: Symbolic	(0)		1.5				3.5			5				7				9
14 GIS: Taxonomic	(0)			2							5.5			7				9
15 GIS: Implicative	(0)	1		2				4		5						8		9
16 Error: Financial	0	(1)						4				6			7.5			9
Insert error: Dropping sterile instruments or solutions so that replacement is required																		
17 Error: Human	0	1		2		(3)					5.5			7		8		9
Insert error: Inattention to maintaining sterile fields and consequences of that																		

Check here if this is a master sheet . . . (X)

Circle the pre-entered scale value chosen for each scale.

Figure B.6 TASK DESCRIPTION SHEET FOR TASK 153
ANNOTATED FOR SKILL SCALE VALUES

Code 153 P. 1 of 1

1. What is the output of this task? (Be sure this is broad enough to be repeatable.)

Materials handed to MD or co-worker; patient given reassurance; blood wiped away; patient restrained; equipment turned on or off or adjusted as ordered.

2. What is used in performing this task? (Note if only certain items must be used. If there is choice, include everything or the kinds of things chosen among.)

Materials, solutions, equipment used in special procedures; sterile gloves; sterile gauze

3. Is there a recipient, respondent or co-worker involved in the task? Yes...(X) No...( )

4. If "Yes" to q. 3: Name the kind of recipient, respondent or co-worker involved, with descriptions to indicate the relevant condition; include the kind with whom the performer is not allowed to deal if relevant to knowledge requirements or legal restrictions.

Physician or co-worker; any patient

5. Name the task so that the answers to questions 1-4 are reflected. Underline essential words.

Assisting physician or co-worker in special examination or treatment procedures by handing materials called for, turning equipment on or off as ordered, wiping away blood, reassuring and comforting patient, or restraining patient as requested.

Figure B.6 TASK DESCRIPTION SHEET (continued)

Task Code No. 153

This is page 1 of 1 for this task.

List Elements Fully
Performer may be asked to assist physician or co-worker in treatment or examination procedures. 1. Performer goes to room assigned. May go and get any equipment as requested. 2. As physician or co-worker asks for specific items such as instruments, solutions, and materials (which are generally familiar or labeled) performer hands these as requested. May use sterile gloves if required. 3. If requested, will turn equipment on or off or adjust as ordered. 4. If requested, performer will use sterile gauze and wipe away excess blood from designated areas of patient's body or equipment. May use sterile gloves. 5. If requested, performer will attend to patient's comfort by reassuring, helping to make comfortable. 6. If requested, performer may help to restrain or immobilize patient or prevent from falling off table.
OK-RP;RR;RR
6. Check here if this is a master sheet..(X)

Financial error consequences: Dropping items so that replacement is required 1.0

Reading use of language 2.0

Human error consequences: Not maintaining sterile field 2 possible contamination or delay 3.0

Human interaction 5.0

Oral use of language 4.0

object manipulation (restraints) 1.5

Decision making on quality 1.5

Figure B.7 HSMS SKILL SCALING SHEET FOR TASK NO. 182

Task Name Setting up and using suction machine to clear airway or assist with gastric lavage. Task Code No. 182

Institution _____ Analysts _____

Scale	Circle Appropriate Scale Value for Each Scale																	
	0	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7	7.5	8	8.5	9
1 Frequency	0	1		2		3		4				6		7		8		9
2 Locomotion	(0)		1.5							5				7				9
3 Object Manipulation	0		1.5				(3.5)			5					7.5			9
4 Guiding or Steering	0		1.5			(3)					5.5			7				9
5 Human Interaction	0	1				3				(5)				7				9
6 Leadership	(0)	1				3			4.5				6.5				8.5	
7 Language: Oral Use	0			2				(4)							7.5			9
Insert name(s) of language(s): English																		
8 Language: Reading Use	0			(2)						5				7				9
Insert name(s) of language(s): English																		
9 Language: Written use	(0)			2						5			6.5					9
Insert name(s) of language(s):																		
10 Decision: Methods	0		1.5			(3)			4.5					7				9
11 Decision: Quality	0		1.5	2			3.5				5.5			(7)				9
12 GIS: Figural	(0)	1					3.5			5				7				9
13 GIS: Symbolic	(0)		1.5				3.5			5				7				9
14 GIS: Taxonomic	(0)			2							5.5			7				9
15 GIS: Implicative	0	(1)		2				4		5						8		9
16 Error: Financial	(0)	1						4				6			7.5			9
Insert error:																		
17 Error: Human	0	1		(2)		3					5.5			7		8		9
Insert error: Using poor technique for suctioning.																		

Check here if this is a master sheet . . . (X)

Circle the pre-entered scale value chosen for each scale.

Figure B.8 TASK DESCRIPTION SHEET FOR TASK 182
ANNOTATED FOR SKILL SCALE VALUES

Code 182 B.142

1. What is the output of this task? (Be sure this is broad enough to be repeatable.)

Patient and suction machine readied for suctioning; tracheal passageway cleared or machine turned on and off as ordered; patient cleansed and/or machine cleansed; matter removed shown to MD.

2. What is used in performing this task? (Note if only certain items must be used. If there is choice, include everything or the kinds of things chosen among.)

MD's orders; patient's chart or check list; suction machine; antiseptic soap, water; tubing and sterile catheter(s) for suction machine; trap and drainage bottles; cup; gauze, saline solution; sheet; clock or watch

3. Is there a recipient, respondent or co-worker involved in the task? Yes...(X) No...( )

4. If "Yes" to q. 3: Name the kind of recipient, respondent or co-worker involved, with descriptions to indicate the relevant condition; include the kind with whom the performer is not allowed to deal if relevant to knowledge requirements or legal restrictions.

Any patient to be treated with use of suction machine; physician; co-worker

5. Name the task so that the answers to questions 1-4 are reflected. Underline essential words.

Setting up and using suction machine to clear airway or to assist with gastric lavage, by obtaining materials and machine, preparing patient, checking machine, turning machine on and off as ordered for gastric lavage, or inserting catheter into tracheal opening and clearing airway; cleaning up afterwards.

Figure B.8 TASK DESCRIPTION SHEET (continued)

Task Code No. 182

This is page 1 of 2 for this task.

List Elements Fully
Performer uses suction machine for purposes such as gastric lavage (when MD inserts catheter) or with patient who has had a tracheostomy performed for the insertion of a tube for breathing. Performer uses suction machine as result of: a. Verbal or written request of physician. b. Own decision based on observation of patient's need. 1. Performer reads physician's orders on chart or check list, listens to verbal orders, or considers own decision. 2. Obtains necessary materials from storage area or checks that these are with machine. If obtained separately, performer places on table near patient or machine. 3. Performer wheels suction machine near patient or wheels patient to machine if stationary wall unit. (May check that machine is clean; may decide to clean or have cleaned). If not already done, plugs machine's cord into wall outlet. 4. Performer may explain to patient what will be done. May drape patient with sheet. 5. Performer checks machine by turning on suction and checking suction outlet with finger to feel suction. If machine is not functioning, decides to report; obtains another (portable) machine or wheels patient to another machine. OK-RP;RR;RR
6. Check here if this is a master sheet..(X)

Reading use 2.0

Guiding or steering with very ill patient: no jostling 3.0

Quality

Oral use of language 4.0

Decision making on methods

Figure B.8 TASK DESCRIPTION SHEET (continued)

Task Code No. 182

This is page 2 of 2 for this task.

List Elements Fully	List Elements Fully
6. Attaches prepackaged tubing and catheter set to machine by connecting tubing to machine and catheter to tubing.	
7. If gastric lavage, performer turns machine on and off at physician's orders after he or she has inserted catheter. Stands by during process.	
8. If patient has had a tracheostomy and needs passage cleared, performer inserts the suctioning catheter with appropriate force to enter the tracheal opening. When inserted to appropriate level, performer turns on suction and attempts to clear mucus from the passageway. Turns off machine when done.	→ object manipulation 3.5 → Manipulative skills 1.0
Performer may reassure or comfort patient during process; determines whether passage has been cleaned	→ Human interaction 5.0 → Decision making on quality 7.0
If not, performer uses fresh catheter(s) and repeats suctioning until the airway is clear.	
9. Performer may clean the area surrounding the tracheal opening with gauze and saline solution.	→ Decision making on methods 3.0
10. After use, performer discards the tubing and catheter(s). May place some of the matter removed from the patient in a cup, pouring it from the drainage bottle or glass, and may show to physician (if requested to do so).	
11. Discards cup or matter in bottle; may decide to wash machine and bottles or have subordinate wash (using antiseptic soap and water). Returns machine or has it returned (if portable).	→ Human Error: poor technique with suctioning : 2.0
12. Records what was done and time on patient's chart or check list, or informs physician that task is completed.	

Figure B.9 HSMS SKILL SCALING SHEET FOR TASK NO. 533

Task Name Checking automatic exposure termination of diagnostic radiography equipment. Task Code No. 533

Institution _____ Analysts _____

Scale	Circle Appropriate Scale Value for Each Scale																	
	0	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7	7.5	8	8.5	9
1 Frequency	0	1		2		3		4				6		7		8		9
2 Locomotion	(0)		1.5							5				7				9
3 Object Manipulation	(0)		1.5				3.5			5					7.5			9
4 Guiding or Steering	(0)		1.5			3					5.5			7				9
5 Human Interaction	0	1				(3)				5				7				9
6 Leadership	(0)	1				3			4.5				6.5				8.5	
7 Language: Oral Use	0			2				(4)							7.5			9
Insert name(s) of language(s): English																		
8 Language: Reading Use	0			2						(5)				7				9
Insert name(s) of language(s): English																		
9 Language: Written use	0			(2)						5			6.5					9
Insert name(s) of language(s): English																		
10 Decision: Methods	0		1.5			(3)			4.5					7				9
11 Decision: Quality	0		1.5	2			3.5				5.5			(7)				9
12 GIS: Figural	0	(1)					3.5			5				7				9
13 GIS: Symbolic	(0)		1.5				3.5			5				7				9
14 GIS: Taxonomic	(0)			2							5.5			7				9
15 GIS: Implicative	0	(1)		2				4		5						8		9
16 Error: Financial	0	(1)						4				6			7.5			9
Insert error: Damaging equipment during test by faulty handling.																		
17 Error: Human	0	1		2		3					(5.5)			7		8		9
Insert error: Drawing wrong conclusion about test results.																		

Check here if this is a master sheet . . . (X)

Circle the pre-entered scale value chosen for each scale.

Figure B.10 TASK DESCRIPTION SHEET FOR TASK 533 ANNOTATED FOR SKILL SCALE VALUES

code 533 p. 1 of 2

1. What is the output of this task? (Be sure this is broad enough to be repeatable.)

Phototiming device checked for automatic exposure termination at constant density; test films measured for density; density control accuracy calculated and compared with given acceptable limits; decision made to refuse equipment, repair; test results recorded.

2. What is used in performing this task? (Note if only certain items must be used. If there is choice, include everything or the kinds of things chosen among.)

Requirements for diagnostic radiography phototiming equipment; manufacturer's specifications; cassettes; radiopaque markers; diagnostic radiography unit, controls; test descriptions, forms; pen, pencil; test phantoms; densitometer; out-of-order sign; phone

reading use of language

3. Is there a recipient, respondent or co-worker involved in the task? Yes...(X) No...( )

4. If "Yes" to q. 3: Name the kind of recipient, respondent or co-worker involved, with descriptions to indicate the relevant condition; include the kind with whom the performer is not allowed to deal if relevant to knowledge requirements or legal restrictions.

Supervisor; radiologist; repair service personnel or installers

5. Name the task so that the answers to questions 1-4 are reflected. Underline essential words.

Checking automatic exposure termination of diagnostic radiography equipment by making test exposures at constant density settings with different kVp's or different phantom thicknesses; using densitometer to measure density of exposed films; calculating accuracy; determining whether automatic timer needs replacement, repair; recording test results; arranging for repair.

Figure B.10 TASK DESCRIPTION SHEET (continued)

Task Code No. 533

This is page 1 of 2 for this task.

List Elements Fully
Performer checks the automatic exposure termination device of diagnostic x-ray equipment which has been newly installed, or checks current equipment periodically, as a result of: a. Regular assignment. b. Request. c. Decision to do. 1. Performer determines reason for check and type of equipment. May proceed as follows: a. Performer notes whether test will be made for three kVp settings at a normal density control setting and mA range, or at a fixed kVp with three phantoms of different densities at the normal density control setting, depending on type of equipment. Checks manufacturer's specifications. b. Obtains appropriate phantom(s) and densitometer. 2. Performer sets up for test: a. Obtains cassettes loaded with uniform type of test film (from same batch) and screen combinations. i) Identifies cassettes as appropriate for test using radiopaque markers. ii) Inserts first cassette in bucky tray of x-ray unit or spot film unit, or advances film as ap-
OK-RP;RR;RR
6. Check here if this is a master sheet..(X)

Decision making on quality (taking care to) throughout 7.0

Reading use of Language 5.0

Figure B.10 TASK DESCRIPTION SHEET (continued)

Task Code No. 533

This is page 2 of 2 for this task.

List Elements Fully
propriate (such as for automatic changer). b. Places phantom (or first of three phantoms) on tabletop, and centers to film using appropriate optical system. Sets tube to appropriate target-to-film distance. c. Sets technical factors as appropriate to type of automatic exposure termination system. i) Sets for automatic exposure mode and normal density setting. ii) If appropriate sets test mA or first kVp setting. 3. Performer makes first exposure as appropriate and continues with test: a. Removes cassette. b. Inserts new cassette in tray and either sets kVp to a lower test position or places a second phantom on table. Makes exposure. c. Removes cassette. Inserts a new cassette and either sets kVp to a higher test position or places a third phantom on table. Makes exposure. d. Performer has exposed test films processed under standard conditions. i) May personally check that standard processing conditions are met. ii) Uses densitometer to measure density on exposed test films. iii) May use control test film to subtract background density. iv) Records measurements from densitometer. 4. Performer determines whether the densities of the three films are the same or within an acceptable range of each other. Refers to test standards.

Figural 1.0

quality

Decision Making on Methods 30

methods, quality

quality

Figure B.10 TASK DESCRIPTION SHEET (continued)

Task Code No. 533

This is page 2 of 2 for this task.

List Elements Fully
a. For new equipment, determines whether the unit should be refused or whether service staff should be required to make adjustments or replace phototiming unit.
b. For existing equipment, determines whether problem requires shut down of unit until adjustments or repairs are made.
c. Performer may discuss results of test with supervisor and/or radiologist in charge before determining what to do. May explain effect of problems and deviations from acceptable standards in terms of patient exposure, diagnostic reliability, legal requirements.
d. If performer decides that the test results indicate a major fault, performer informs repair service by calling in-house repair personnel or manufacturer's repair service. Indicates the results of the test and the unit involved. May place out-of-order sign on unit.
e. If not already done, performer marks test records with date; may record evaluation of results and what was done. Performer places records in appropriate location for filing. Returns test equipment to storage or has this done.

Quality Implicative 1.0

Human interaction 3.0

Oral use of language 4.0

Implicative skills 1.0

Written use of Language 2.0

ERROR: Financial : damage to equipment 1.0

ERROR Human : wrong conclusion results in retakes for patients 5.5

Figure B.11 HSMS KNOWLEDGE IDENTIFICATION SHEET FOR TASK NO. 74

Task Name Explaining to any out-pt. or accompanying adult proper at-home procedures to follow prior to coming for radiographic exam. Task Code No. 74

Analysts

Institution page 1 of 1 for this task.

For every category chosen: remember to examine whether, if you have chosen a broad-level category, any of the related finer-level break-outs apply; whether, if you have chosen a fine-level break-out, the related broad level category applies.

Abbreviated Knowledge Classification System Name	Knowledge System 8-digit ID	Scale Value
Diagnostic Radiography	12223000	2.5

Check here if this is a master sheet . . . (X)

Figure B.12 TASK DESCRIPTION SHEET FOR TASK 74
ANNOTATED FOR KNOWLEDGE AND SCALE VALUES

Code 74 p. 1491

1. What is the output of this task? (Be sure this is broad enough to be repeatable.)

A patient or accompanying adult reinforced about procedures to follow at home prior to coming for radiographic examination.

2. What is used in performing this task? (Note if only certain items must be used. If there is choice, include everything or the kinds of things chosen among.)

X-ray requisition sheet; written prior preparation orders for patient; instruction sheet on prior preparation

3. Is there a recipient, respondent or co-worker involved in the task? Yes...(X) No...( )

4. If "Yes" to q. 3: Name the kind of recipient, respondent or co-worker involved, with descriptions to indicate the relevant condition; include the kind with whom the performer is not allowed to deal if relevant to knowledge requirements or legal restrictions.

Any out-patient; accompanying adult; receptionist or co-worker

5. Name the task so that the answers to questions 1-4 are reflected. Underline essential words.

Explaining to any out-patient or accompanying adult proper at-home procedures to follow prior to coming for radiographic or fluoroscopic examination, by reading what is required; presenting written instructions; explaining; and checking that patient understands.

Figure B.12 TASK DESCRIPTION SHEET (continued)

Task Code No. 74

This is page 1 of 1 for this task.

List Elements Fully
Performer may be asked to reinforce orders which an out-patient is to or was to have followed at home before certain radiographic examinations as a result of: a. Request. b. Regular assignment. 1. Performer asks what examination is involved and/or reads requisition form to learn what radiographic procedure was ordered and/or orders for any prior preparation for the patient to carry out at home, such as cleansing enema and/or abstinence from food or drink for a given period of time. 2. Performer presents written instructions to patient. Explains carefully to patient what must be done or not done before coming for the next appointment for radiography. Checks to be sure that patient understands. May explain reasons, nature of examination and details of what to do. If appropriate, performer explains to adult accompanying a pediatric patient how to prepare patient. OK-RP;RR;RR
6. Check here if this is a master sheet..(X)

Diagnostic radiography 2.5

136

Figure B.13 HSMS KNOWLEDGE IDENTIFICATION SHEET FOR TASK NO. 138

Task Name Reporting observed symptoms and concerns of any pt. to physician or staff member Task Code No. 138

Institution _____ Analysts _____

page 1 of 1 for this task.

For every category chosen: remember to examine whether, if you have chosen a broad-level category, any of the related finer-level break-outs apply; whether, if you have chosen a fine-level break-out, the related broad level category applies.

Abbreviated Knowledge Classification System Name	Knowledge System 8-digit ID	Scale Value
No knowledge categories		

Check here if this is a master sheet . . . (X)

Figure B.14 TASK DESCRIPTION SHEET FOR TASK 138
ANNOTATED FOR KNOWLEDGE AND SCALE VALUES

Code 138 p. 141

1. What is the output of this task? (Be sure this is broad enough to be repeatable.)

Symptoms or concerns of patient indicating health problem observed or discussed and reported to physician or appropriate staff member.

2. What is used in performing this task? (Note if only certain items must be used. If there is choice, include everything or the kinds of things chosen among.)

— —

3. Is there a recipient, respondent or co-worker involved in the task? Yes...(X) No...( )

4. If "Yes" to q. 3: Name the kind of recipient, respondent or co-worker involved, with descriptions to indicate the relevant condition; include the kind with whom the performer is not allowed to deal if relevant to knowledge requirements or legal restrictions.

Any patient; physician or staff member

5. Name the task so that the answers to questions 1-4 are reflected. Underline essential words.

Reporting observed symptoms and concerns of any patient to physician or staff member by observing patient's behavior, engaging in conversation; verbally reporting information considered to be helpful for patient's care to physician or appropriate staff member.

Figure B.14 TASK DESCRIPTION SHEET (continued)

Task Code No. 138

This is page 1 of 1 for this task.

No Knowledge

List Elements Fully
Performer must be alert to notice any symptoms or concerns manifested by the patient which should be brought to the attention of physician or staff. 1. As performer interacts with patient before and/or after patient has seen physician, performer notes conditions, symptoms, or behavior which should be brought to physician's attention, such as shortness of breath, sudden weakness, flushing, rash, tremors. 2. Notes whether, in conversation, patient mentions symptoms or worries related to health, or concerns which would indicate information helpful to physician in caring for patient. 3. Reports verbally to physician or appropriate staff member who would relay information. OK-RP;RR;RR
6. Check here if this is a master sheet..(X)

Figure B.15 HSMS KNOWLEDGE IDENTIFICATION SHEET FOR TASK NO. 153

Task Name Assisting physician or co-worker in special exam or treatment procedures Task Code No. 153

Institution _____ Analysts _____ page 1 of 1 for this task.

For every category chosen: remember to examine whether, if you have chosen a broad-level category, any of the related finer-level break-outs apply; whether, if you have chosen a fine-level break-out, the related broad level category applies.

Abbreviated Knowledge Classification System Name	Knowledge System 8-digit ID	Scale Value
Handling and transportation of the sick or wounded	11737300	1.5
Asepsis	11738000	2.5

Check here if this is a master sheet . . . (X)

Figure B.16 TASK DESCRIPTION SHEET FOR TASK 153
ANNOTATED FOR KNOWLEDGE AND SCALE VALUES

Code 153 p. 1171

1. What is the output of this task? (Be sure this is broad enough to be repeatable.)

Materials handed to MD or co-worker; patient given reassurance; blood wiped away; patient restrained; equipment turned on or off or adjusted as ordered.

2. What is used in performing this task? (Note if only certain items must be used. If there is choice, include everything or the kinds of things chosen among.)

Materials, solutions, equipment used in special procedures; sterile gloves; sterile gauze

3. Is there a recipient, respondent or co-worker involved in the task? Yes...(X) No...( )

4. If "Yes" to q. 3: Name the kind of recipient, respondent or co-worker involved, with descriptions to indicate the relevant condition; include the kind with whom the performer is not allowed to deal if relevant to knowledge requirements or legal restrictions.

Physician or co-worker; any patient

5. Name the task so that the answers to questions 1-4 are reflected. Underline essential words.

Assisting physician or co-worker in special examination or treatment procedures by handing materials called for, turning equipment on or off as ordered, wiping away blood, reassuring and comforting patient, or restraining patient as requested.

Figure B.16 TASK DESCRIPTION SHEET (continued)

Task Code No. 153

This is page 1 of 1 for this task.

List Elements Fully
Performer may be asked to assist physician or co-worker in treatment or examination procedures. 1. Performer goes to room assigned. May go and get any equipment as requested. 2. As physician or co-worker asks for specific items such as instruments, solutions, and materials (which are generally familiar or labeled) performer hands these as requested. May use sterile gloves if required. 3. If requested, will turn equipment on or off or adjust as ordered. 4. If requested, performer will use sterile gauze and wipe away excess blood from designated areas of patient's body or equipment. May use sterile gloves. 5. If requested, performer will attend to patient's comfort by reassuring, helping to make comfortable. 6. If requested, performer may help to restrain or immobilize patient or prevent from falling off table.
OK-RP;RR;RR
6. Check here if this is a master sheet..(X)

Asepsis 2.5

Handling and transp. of sick or wounded 1.5

142

Figure B.17 HSMS KNOWLEDGE IDENTIFICATION SHEET FOR TASK NO. 182

Task Name Setting up and using suction machine to clear airway or assist with gastric lavage Task Code No. 182

Institution _____ Analysts _____ page 1 of 1 for this task.

For every category chosen: remember to examine whether, if you have chosen a broad-level category, any of the related finer-level break-outs apply; whether, if you have chosen a fine-level break-out, the related broad level category applies.

Abbreviated Knowledge Classification System Name	Knowledge System 8-digit ID	Scale Value
Introductory procedures	11735400	1.5
Mechanics of writing English	65620000	1.5

Check here if this is a master sheet . . . (X)

Figure B.18 TASK DESCRIPTION SHEET FOR TASK 182
ANNOTATED FOR KNOWLEDGE AND SCALE VALUES

Code 182 P-142

1. What is the output of this task? (Be sure this is broad enough to be repeatable.)

Patient and suction machine readied for suctioning; tracheal passageway cleared or machine turned on and off as ordered; patient cleansed and/or machine cleansed; matter removed shown to MD.

2. What is used in performing this task? (Note if only certain items must be used. If there is choice, include everything or the kinds of things chosen among.)

MD's orders; patient's chart or check list; suction machine; antiseptic soap, water; tubing and sterile catheter(s) for suction machine; trap and drainage bottles; cup; gauze, saline solution; sheet; clock or watch

3. Is there a recipient, respondent or co-worker involved in the task? Yes...(X) No...( )

4. If "Yes" to q. 3: Name the kind of recipient, respondent or co-worker involved, with descriptions to indicate the relevant condition; include the kind with whom the performer is not allowed to deal if relevant to knowledge requirements or legal restrictions.

Any patient to be treated with use of suction machine; physician; co-worker

5. Name the task so that the answers to questions 1-4 are reflected. Underline essential words.

Setting up and using suction machine to clear airway or to assist with gastric lavage, by obtaining materials and machine, preparing patient, checking machine, turning machine on and off as ordered for gastric lavage, or inserting catheter into tracheal opening and clearing airway; cleaning up afterwards.

Figure B.18 TASK DESCRIPTION SHEET (continued)

Task Code No. 182

This is page 1 of 2 for this task.

List Elements Fully
Performer uses suction machine for purposes such as gastric lavage (when MD inserts catheter) or with patient who has had a tracheostomy performed for the insertion of a tube for breathing. Performer uses suction machine as result of: a. Verbal or written request of physician. b. Own decision based on observation of patient's need. 1. Performer reads physician's orders on chart or check list, listens to verbal orders, or considers own decision. 2. Obtains necessary materials from storage area or checks that these are with machine. If obtained separately, performer places on table near patient or machine. 3. Performer wheels suction machine near patient or wheels patient to machine if stationary wall unit. (May check that machine is clean; may decide to clean or have cleaned). If not already done, plugs machine's cord into wall outlet. 4. Performer may explain to patient what will be done. May drape patient with sheet. 5. Performer checks machine by turning on suction and checking suction outlet with finger to feel suction. If machine is not functioning, decides to report; obtains another (portable) machine or wheels patient to another machine. OK-RP; RR; RR
6. Check here if this is a master sheet..(X)

Figure B.18 TASK DESCRIPTION SHEET (continued)

Task Code No. 182

This is page 2 of 2 for this task.

List Elements Fully	List Elements Fully
6. Attaches prepackaged tubing and catheter set to machine by connecting tubing to machine and catheter to tubing. 7. If gastric lavage, performer turns machine on and off at physician's orders after he or she has inserted catheter. Stands by during process. 8. If patient has had a tracheostomy and needs passage cleared, performer inserts the suctioning catheter with appropriate force to enter the tracheal opening. When inserted to appropriate level, performer turns on suction and attempts to clear mucus from the passageway. Turns off machine when done. Performer may reassure or comfort patient during process; determines whether passage has been cleaned. If not, performer uses fresh catheter(s) and repeats suctioning until the airway is clear. 9. Performer may clean the area surrounding the tracheal opening with gauze and saline solution. 10. After use, performer discards the tubing and catheter(s). May place some of the matter removed from the patient in a cup, pouring it from the drainage bottle or glass, and may show to physician (if requested to do so). 11. Discards cup or matter in bottle; may decide to wash machine and bottles or have subordinate wash (using antiseptic soap and water). Returns machine or has it returned (if portable). 12. Records what was done and time on patient's chart or check list, or informs physician that task is completed.	Introductory procedures 1.5 Mechanics of writing English 1.5

Figure B.19 HSMS KNOWLEDGE IDENTIFICATION SHEET FOR TASK NO. 533

Task Name Checking automatic exposure termination of diagnostic radiography equipment. Task Code No. 533

Institution _____ Analysts _____

page 1 of 1 for this task.

For every category chosen: remember to examine whether, if you have chosen a broad-level category, any of the related finer-level break-outs apply; whether, if you have chosen a fine-level break-out, the related broad level category applies.

Abbreviated Knowledge Classification System Name	Knowledge System 8-digit ID	Scale Value
Radio biology	12210000	2.5
Diagnostic radiography	12223000	3.5
Interaction with radiation	15222500	1.5
Mechanics of writing English	65620000	1.5

Check here if this is a master sheet . . . (X)

Figure B.20 TASK DESCRIPTION SHEET FOR TASK 533
ANNOTATED FOR KNOWLEDGE AND SCALE VALUES

Code 533 p 1of2

1. What is the output of this task? (Be sure this is broad enough to be repeatable.)

Phototiming device checked for automatic exposure termination at constant density; test films measured for density; density control accuracy calculated and compared with given acceptable limits; decision made to refuse equipment, repair; test results recorded.

2. What is used in performing this task? (Note if only certain items must be used. If there is choice, include everything or the kinds of things chosen among.)

Requirements for diagnostic radiography phototiming equipment; manufacturer's specifications; cassettes; radiopaque markers; diagnostic radiography unit, controls; test descriptions, forms; pen, pencil; test phantoms; densitometer; out-of-order sign; phone

3. Is there a recipient, respondent or co-worker involved in the task? Yes...(X) No...( )

4. If "Yes" to q. 3: Name the kind of recipient, respondent or co-worker involved, with descriptions to indicate the relevant condition; include the kind with whom the performer is not allowed to deal if relevant to knowledge requirements or legal restrictions.

Supervisor; radiologist; repair service personnel or installers

5. Name the task so that the answers to questions 1-4 are reflected. Underline essential words.

Checking automatic exposure termination of diagnostic radiography equipment by making test exposures at constant density settings with different kVp's or different phantom thicknesses; using densitometer to measure density of exposed films; calculating accuracy; determining whether automatic timer needs replacement, repair; recording test results; arranging for repair.

Figure B.20 TASK DESCRIPTION SHEET (continued)

Task Code No. 533

This is page 1 of 2 for this task.

List Elements Fully
Performer checks the automatic exposure termination device of diagnostic x-ray equipment which has been newly installed, or checks current equipment periodically, as a result of: a. Regular assignment. b. Request. c. Decision to do. 1. Performer determines reason for check and type of equipment. May proceed as follows: a. Performer notes whether test will be made for three kVp settings at a normal density control setting and mA range, or at a fixed kVp with three phantoms of different densities at the normal density control setting, depending on type of equipment. Checks manufacturer's specifications. b. Obtains appropriate phantom(s) and densitometer. 2. Performer sets up for test: a. Obtains cassettes loaded with uniform type of test film (from same batch) and screen combinations. i) Identifies cassettes as appropriate for test using radiopaque markers. ii) Inserts first cassette in bucky tray of x-ray unit or spot film unit, or advances film as ap-
OK-RP;RR;RR
6. Check here if this is a master sheet. (X)

Interaction with radiation in diagnostic radiography

Figure B.20 TASK DESCRIPTION SHEET (continued)

Task Code No. 533

List Elements Fully	
propriate (such as for automatic changer). b. Places phantom (or first of three phantoms) on tabletop, and centers to film using appropriate optical system. Sets tube to appropriate target-to-film distance. c. Sets technical factors as appropriate to type of automatic exposure termination system. i) Sets for automatic exposure mode and normal density setting. ii) If appropriate sets test mA or first kVp setting.	Diagnostic radiography 3.5
3. Performer makes first exposure as appropriate and continues with test: a. Removes cassette. b. Inserts new cassette in tray and either sets kVp to a lower test position or places a second phantom on table. Makes exposure.	Diagnostic radiography 3.5
c. Removes cassette. Inserts a new cassette and either sets kVp to a higher test position or places a third phantom on table. Makes exposure.	Interaction with radiation 1.5
d. Performer has exposed test films processed under standard conditions. i) May personally check that standard processing conditions are met. ii) Uses densitometer to measure density on exposed test films. iii) May use control test film to subtract background density. iv) Records measurements from densitometer.	
4. Performer determines whether the densities of the three films are the same or within an acceptable range of each other. Refers to test standards.	diagnostic radiography

Figure B.20 TASK DESCRIPTION SHEET (continued)

Task Code No. 533

This is page 2 of 2 for this task.

List Elements Fully
a. For new equipment, determines whether the unit should be refused or whether service staff should be required to make adjustments or replace phototiming unit.
b. For existing equipment, determines whether problem requires shut down of unit until adjustments or repairs are made.
c. Performer may discuss results of test with supervisor and/or radiologist in charge before determining what to do. May explain effect of problems and deviations from acceptable standards in terms of patient exposure, diagnostic reliability, legal requirements.
d. If performer decides that the test results indicate a major fault, performer informs repair service by calling in-house repair personnel or manufacturer's repair service. Indicates the results of the test and the unit involved. May place out-of-order sign on unit.
e. If not already done, performer marks test records with date; may record evaluation of results and what was done. Performer places records in appropriate location for filing. Returns test equipment to storage or has this done.

Radiobiology

Radiobiology 2.5

Interaction with radiation 1.5

Mechanics of English writing 1.5

APPENDIX C

EXAMPLES OF CURRICULUM OUTLINES

(From Research Report No. 8, Volume 2)

Figure C.1 Example of Index of Curriculum Objectives. C-1

Figure C.2 Example of Curriculum Outline Arranged As Educational Ladder. C-9

Figure C.1 EXAMPLE OF INDEX OF CURRICULUM OBJECTIVES

Table 3. CURRICULUM OUTLINE ASSUMING THAT RADIOLOGIC TECHNOLOGIST OCCUPATION COVERS FOUR FACTORS[a] AND THREE LEVELS[b]

Abbreviated Name of Skill or Knowledge Category	Scale Value	Job Levels by Factor: Pt. Care	Qual. Assur.	Rad. Tech.	Admin. (A)	Curriculum Objective Nos.: Pt. Care	Qual. Assur.	Rad. Tech.	Adm. (A)
Object Manipulation Skills	1.5	1, 2	1, 2	3		1 2	3 4	5	
	3.5	1, 2	1, 2	3		6 7	8 9	10	
	5.0	2	1			11	12		
	7.5	2				13			
Guiding or Steering Skills	1.5	1	1, 2	3		14	15 16	17	
	3.0	1, 2				18 19			
Human Interaction Skills	1.0	1, 2	1, 2	3	3	20 21	22 23	24	25
	3.0	1, 2	1, 2	3	3	26 27	28 29	30	31
	5.0	1, 2		3	3	32 33		34	35
	7.0	2				36			
Leadership Skills	1.0	2	1		3	37	38		39
	4.5	2			3	40			41
Oral Use of a Relevant Language	2.0	1, 2	1, 2		3	42 43	44 45		46
	4.0	1, 2	1, 2	3	3	47 48	49 50	51	52
	7.5			3				53	
Reading Use of a Relevant Language	2.0	1, 2	1, 2	3	3	54 55	56 57	58	59
	5.0	2	1, 2	3		60	61 62	63	
Written Use of a Relevant Language	2.0	1, 2	1, 2	3	3	64 65	66 67	68	69
	5.0		2				70		
Decision Making on Methods	1.5	1, 2	1, 2	3	3	71 72	73 74	75	76
	3.0	1, 2	1, 2	3	3	77 78	79 80	81	82
	4.5	1	2	3		83	84	85	
	7.0	2				86			

[a] The four factors are: Patient and Emergency Care (IV); Quality Assurance (VI); Radiologic Technology (III); and Administration (non-factor A).

[b] The three levels are: aide (1); technician (2); and technologist (3).

Table 3 (continued)

Abbreviated Name of Skill or Knowledge Category	Scale Value	Job Levels by Factor: Pt. Care	Qual. Assur.	Rad. Tech.	Admin. (A)	Curriculum Objective Nos.: Pt. Care	Qual. Assur.	Rad. Tech.	Adm. (A)
Decision Making on Quality	1.5	1, 2				87 88			
	2.0	1, 2	1	3		89 90	91	92	
	3.5	1, 2	1, 2	3	3	93 94	95 96	97	98
	5.5			3	3			99	100
	7.0	1, 2	2	3	3	101 102	103	104	105
Figural Skills	1.0	1, 2	2	3		106 107	108	109	
	3.5		2	3			110	111	
	5.0			3				112	
Symbolic Skills	1.5		1, 2	3			113 114	115	
Taxonomic Skills	2.0	2	2	3		116	117	118	
Implicative Skills	1.0	1, 2	1, 2	3		119 120	121 122	123	
	2.0	1, 2	2	3		124 125	126	127	
	5.0	2				128			
Financial Consequences of Error	1.0	1, 2	1, 2	3	3	129 130	131 132	133	134
	4.0		1, 2	3			135 136	137	
Consequences of Error To Humans	1.0	1, 2	1, 2	3	3	138 139	140 141	142	143
	2.0	1, 2	1	3		144 145	146	147	
	3.0	1, 2	1, 2	3		148 149	150 151	152	
	5.5	1, 2	1, 2	3		153 154	155 156	157	
	7.0	1, 2	2	3		158 159	160	161	
11731000 Normal structure and function	2.5			3				162	
11731100 Regional anatomy (head and neck, thorax and abdomen, pelvis and perineum, lower and upper limbs, skeleton)	2.5			3				163	
	3.5		2	3			164	165	
	5.5		2	3			166	167	
	7.0			3				168	

Table 3 (continued)

Abbreviated Name of Skill or Knowledge Category	Scale Value	Job Levels by Factor				Curriculum Objective Nos.			
		Pt. Care	Qual. Assur.	Rad. Tech.	Admin. (A)	Pt. Care	Qual. Assur.	Rad. Tech.	Adm. (A)
11731200 Topographic anatomy	1.5	1, 2		3		169 170		171	
	2.5	1				172			
	3.5	2		3		173		174	
	5.5			3				175	
	7.0			3				176	
11731300 Hematopoietic system	1.5			3				177	
11731400 Circulatory system (cardiovascular system, lymphatics)	1.5	1, 2		3		178 179		180	
	2.5	2				181			
11731500 Respiratory system	1.5			3				182	
	2.5	2				183			
11731600 Digestive system	1.5			3				184	
11731610 Mouth, pharynx, esophagus	1.5			3				185	
11731620 Stomach, small intestine	1.5			3				186	
11731630 Large intestine, rectum	1.5			3				187	
11731640 Liver, biliary system, pancreas	1.5			3				188	
11731700 Urinary system	1.5			3				189	
	2.5	2				190			
	3.5	2				191			
11731800 Musculoskeletal system	2.5			3				192	
	3.5			3				193	
	5.5			3				194	

Table 3 (continued)

Abbreviated Name of Skill or Knowledge Category	Scale Value	Job Levels by Factor: Pt. Care	Qual. Assur.	Rad. Tech.	Admin. (A)	Curriculum Objective Nos.: Pt. Care	Qual. Assur.	Rad. Tech.	Adm. (A)
11731820 Bones and joints	2.5			3				195	
	3.5			3				196	
	7.0			3				197	
11731910 Central nervous system	1.5			3				198	
11731943 Eye and optic nerve	1.5			3				199	
11732222 Male reproductive system	1.5			3				200	
11732223 Female reproductive system	1.5			3				201	
11733200 Neoplasms (cancerous growths)	1.5			3				202	
11733400 Disorders of blood, blood-forming organs	1.5			3				203	
11733510 Disorders of central nervous system	1.5			3				204	
11733600 Disorders of circulatory system	1.5	1, 2		3		205 206		207	
	2.5			3				208	
11733700 Disorders of digestive system	1.5			3				209	
11733800 Disorders of respiratory system	1.5			3				210	
	2.5			3				211	
11733900 Disorders of uro-genital system	1.5			3				212	
11734200 Disorders of musculoskeletal system	1.5			3				213	
	2.5			3				214	
11734300 Congenital abnormalities	1.5			3				215	
11734400 Disorders, complications of pregnancy, birth	1.5			3				216	

Table 3 (continued)

Abbreviated Name of Skill or Knowledge Category	Scale Value	Job Levels by Factor				Curriculum Objective Nos.			
		Pt. Care	Qual. Assur.	Rad. Tech.	Admin. (A)	Pt. Care	Qual. Assur.	Rad. Tech.	Adm. (A)
11734600 Burns	3.5	2				217			
11734800 Shock and trauma	1.5			3				218	
	2.5			3				219	
	3.5	2				220			
11735000 Surgery	1.5			3				221	
11735100 Operative procedures	1.5	2		3		222		223	
11735300 Repair surgery	1.5			3				224	
11735400 Introductory procedures	1.5	2	1	3		225	226	227	
	2.5	2		3		228		229	
	3.5	2				230			
11735500 Endoscopy	1.5			3				231	
11735600 Suture	1.5	2				232			
11735800 Delivery methods for childbirth	1.5			3				233	
11736000 Anesthesiology	1.5			3				234	
11737000 First aid and care	2.5			3				235	
	3.5			3				236	
	7.0	2				237			
11737100 Bandages, dressings, tourniquets, splints	1.5	1, 2		3		238 239		240	
	2.5	2				241			
	3.5	2				242			
11737200 Hemorrhage, bleeding; their arrest	1.5	1, 2				243 244			
	3.5	2				245			

Table 3 (continued)

Abbreviated Name of Skill or Knowledge Category	Scale Value	Job Levels by Factor: Pt. Care	Qual. Assur.	Rad. Tech.	Admin. (A)	Curriculum Objective Nos.: Pt. Care	Qual. Assur.	Rad. Tech.	Adm. (A)
11737300 Handling, transportation of sick, wounded	1.5	1				246			
	2.5	1, 2		3		247 248		249	
	3.5	1, 2		3		250 251		252	
	5.5	2		3		253		254	
11737400 Sprains, strains, fractures; their healing	1.5			3				255	
	2.5			3				256	
	3.5	2				257			
11737600 Resuscitation	7.0	2				258			
11737700 Wounds and their healing	1.5	2		3		259		260	
	2.5	2		3		261		262	
	3.5	2				263			
	5.5	2				264			
11738000 Asepsis	1.5	1, 2	1			265 266	267		
	2.5	1, 2	1	3		268 269	270	271	
	3.5	1, 2		3		272 273		274	
12210000 Radiobiology	1.5	1, 2	2			275 276	277		
	2.5	2	2	3		278	279	280	
	3.5		2	3			281	282	
12223000 Diagnostic radiography	1.5		1, 2				283 284		
	2.5	1, 2	1, 2	3		285 286	287 288	289	
	3.5		2	3			290	291	
	5.5		2	3			292	293	
	7.0			3				294	
12300000 Pharmacology	1.5	2	1			295	296		
12331000 Drug toxicity, antidotal therapy	1.5			3				297	
	2.5	2				298			

Table 3 (continued)

Abbreviated Name of Skill or Knowledge Category	Scale Value	Job Levels by Factor				Curriculum Objective Nos.			
		Pt. Care	Qual. Assur.	Rad. Tech.	Admin. (A)	Pt. Care	Qual. Assur.	Rad. Tech.	Adm. (A)
12332000 Drug idiosyncrasy, allergy pharmacogenetics	1.5			3				299	
	2.5	2				300			
12334000 Drug tolerance, physical dependence	2.5	2				301			
12335000 Drug synergism	2.5	2				302			
12336000 Chemical teratogenesis	2.5	2				303			
12341100 Antibacterial, antifungal chemotherapy	2.5	2				304			
	3.5	2				305			
12341300 Cancer and virus chemotherapy	2.5	2				306			
	3.5	2				307			
12342100 Drugs acting on cardiovascular system, smooth muscle	1.5	2				308			
	2.5	2				309			
	3.5	2				310			
12342200 Drugs acting on the blood	2.5	2				311			
	3.5	2				312			
12342300 Hormones, drugs acting on endocrine glands, accessory reproductive organs	2.5	2				313			
	3.5	2				314			
12342600 Drugs for allergy, cough, vomiting	2.5	2				315			
	3.5	2				316			
12342700 Drugs acting on gastrointestinal tract	2.5	2				317			
	3.5	2				318			
12342810 Drugs acting on autonomic nervous system	2.5	2				319			
	3.5	2				320			

Table 3 (continued)

Abbreviated Name of Skill or Knowledge Category	Scale Value	Job Levels by Factor: Pt. Care	Qual. Assur.	Rad. Tech.	Admin. (A)	Curriculum Objective Nos.: Pt. Care	Qual. Assur.	Rad. Tech.	Adm. (A)
12342820 Drugs acting on neuromuscular system	2.5	2				321			
	3.5	2				322			
12342830 Drugs acting on central nervous system	1.5			3				323	
	2.5	2				324			
	3.5	2				325			
12342900 Drugs acting on immunologic system	2.5	2				326			
	3.5	2				327			
15212100 Electric circuit theory	1.5		2				328		
15222500 Interaction with radiation	1.5	2	2	3		329	330	331	
24110000 Electromagnetic field theory applications	1.5		2				332		
24132100 Electronic devices	1.5		2				333		
33000000 Computer technology	1.5		1, 2	3			334 335	336	
41666700 Death and dying behavioral development	1.5			3				337	
51200000 Algebra	1.5		2	3			338	339	
52220000 Descriptive statistics	1.5		2				340		
65260000 Photography, cinematography	1.5		2				341		
65620000 Mechanics of writing English	1.5	2	2			342	343		
	2.5			3				344	
	3.5		2				345		
Procedural Objectives (task sequences)	-	1, 2	1, 2	3	3	346 347	348 349	350	351

Figure C.2 EXAMPLE OF CURRICULUM OUTLINE ARRANGED AS EDUCATIONAL LADDER

Table 5. CURRICULUM OUTLINE ASSUMING THAT RADIOLOGIC TECHNOLOGIST OCCUPATION IS REACHED IN THREE STAGES AND COMBINES THE PATIENT CARE AND RADIOLOGIC TECHNOLOGY FACTORS

Skill or Knowledge Category (abbreviated)	Scale Value	Level 1: Aide Task Codes	Level 1: Aide Curric. Ob.Nos.	Level 2: Technician Task Codes	Level 2: Technician Curric. Ob.Nos.	Level 3: Technologist Task Codes	Level 3: Technologist Curric. Ob.Nos.
Factors:		Patient Care (IV)				Rad. Technology (III)	
Object Manipulation Skills	1.5	98 153 166 199 262 283 292 301 302 303 520 521	1	198 298 308 522	2	355 356 357 358 359 360 361 362 363 364 366 367 368 370 371 372 373 374 378 379 381 382 383 384 385 386 387 389 463 464 465 466 467 468 512 515 517	5
	3.5	287 290	6	156 182 185 243	7	365 375 376 377 380 388 390 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 513 514 516 518 519 526	10
	5.0			18 33 65 133 296 299	11		
	7.5			143 181	13		

Note: Curric. Ob. Nos. = curriculum objective numbers. These appear in numerical order in Research Report No. 8, Chapter 8 of Volume 2. Abbreviated task names are presented in Appendixes A and E of Volume 1 of Research Report No. 8.

Table 5 (continued)

Skill or Knowledge Category (abbreviated)	Scale Value	Level 1: Aide Task Codes	Level 1: Aide Curric. Ob.Nos.	Level 2: Technician Task Codes	Level 2: Technician Curric. Ob.Nos.	Level 3: Technologist Task Codes	Level 3: Technologist Curric. Ob.Nos.
Factors:		Patient Care (IV)				Rad. Technology (III)	
Guiding or Steering Skills	1.5	287 302	14			355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 463 465 466 467 468 491 492 493 494 495 496 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 526	17
	3.0	190	18	182 185	19		
Human Interaction Skills	1.0	166 190 199 278 279 281 291	20	65	21	372 373 464	24
	3.0	74 98 113 155 193 262 271 282 283 287 289 292 295 301 302 303 520 521	26	18 33 133 156 198 280 298 299 308 522	27	81 280 353 369 370 371	30

(continued on next page)

Table 5 (continued)

Skill or Knowledge Category (abbreviated)	Scale Value	Level 1: Aide Task Codes	Level 1: Aide Curric. Ob.Nos.	Level 2: Technician Task Codes	Level 2: Technician Curric. Ob.Nos.	Level 3: Technologist Task Codes	Level 3: Technologist Curric. Ob.Nos.
Factors:		Patient Care (IV)				Rad. Technology (III)	
Human Interaction Skills (continued)	5.0	73 138 153 290 490	32	143 181 182 185 243	33	355 356 357 358 359 360 361 362 363 364 365 366 367 368 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 463 465 466 467 468 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 526	34
	7.0			296	36		
Oral Use of a Relevant Language	2.0	166 190 271 279 281 283 287 289 291 490	42	308	43		

(continued on next page)

Table 5 (continued)

Skill or Knowledge Category (abbreviated)	Scale Value	Level 1: Aide Task Codes	Level 1: Aide Curric. Ob.Nos.	Level 2: Technician Task Codes	Level 2: Technician Curric. Ob.Nos.	Level 3: Technologist Task Codes	Level 3: Technologist Curric. Ob.Nos.
Factors:		Patient Care (IV)				Rad. Technology (III)	
Oral Use of a Relevant Language (continued)	4.0	73 74 98 113 138 153 155 193 199 262 278 282 290 292 295 302 303 520 521	47	18 33 65 133 143 156 181 182 185 198 243 280 296 298 299 522	48	81 280 353 369 370 371 372 373 491 492 493 494 495 497 498 504 505 507 509 510 511 512 513 514 515 516 517 518 519	51
	7.5					355 356 357 358 359 360 361 362 363 364 365 366 367 368 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 463 464 465 466 467 468 496 499 500 501 502 503 506 508 526	53

Skill or Knowledge Category (abbreviated)	Scale Value	Level 1: Aide Task Codes	Level 1: Aide Curric. Ob.Nos.	Level 2: Technician Task Codes	Level 2: Technician Curric. Ob.Nos.	Level 3: Technologist Task Codes	Level 3: Technologist Curric. Ob.Nos.
Factors:		Patient Care (IV)				Rad. Technology (III)	
Reading Use of a Relevant Language	2.0	74 98 153 155 166 190 193 199 262 278 279 281 287 289 290 301 302 303 520	54	18 65 133 143 156 181 182 185 198 296 298 299 308 522	55	353 370 371 372 373	58
	5.0			33 280	60	81 280 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 463 464 465 466 467 468 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 526	63

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Table 5 (continued)

Skill or Knowledge Category (abbreviated	Scale Value	Level 1: Aide Task Codes	Level 1: Aide Curric. Ob.Nos.	Level 2: Technician Task Codes	Level 2: Technician Curric. Ob.Nos.	Level 3: Technologist Task Codes	Level 3: Technologist Curric. Ob.Nos.
Factors:		Patient Care (IV)				Rad. Technology(III)	
Written Use of a Relevant Language	2.0	278 279 295	64	33 156 181 243 522	65	81 353 355 356 357 358 359 360 361 362 363 364 365 366 367 368 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 463 464 465 466 467 468 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 526	68

Table 5 (continued)

Skill or Knowledge Category (abbreviated)	Scale Value	Level 1: Aide		Level 2: Technician		Level 3: Technologist	
		Task Codes	Curric. Ob.Nos.	Task Codes	Curric. Ob.Nos.	Task Codes	Curric. Ob.Nos.
Factors:		Patient Care (IV)				Rad. Technology (III)	
Decision Making on Methods	1.5	98 199 262 279 281 282 283 287 295 490 520 521	71	143 181 298	72	353 370 371 372 373	75
	3.0	155 166 190 193 278 303	77	18 33 65 133 156 182 185 243 299 308	78	81 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 463 464 465 466 467 468 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 526	81
	4.5	73 113 138 290	83			355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 491 492 493 494 495 496	85
	7.0			296	86		

Table 5 (continued)

Skill or Knowledge Category (abbreviated)	Scale Value	Level 1: Aide Task Codes	Level 1: Aide Curric. Ob.Nos.	Level 2: Technician Task Codes	Level 2: Technician Curric. Ob.Nos.	Level 3: Technologist Task Codes	Level 3: Technologist Curric. Ob.Nos.
Factors:		Patient Care (IV)				Rad. Technology (III)	
Decision Making on Quality	1.5	153	87	198	88		
	2.0	193 199	89	308	90	464	92
	3.5	166 262 278 281 282 283 290 291 292 302 303 490 520 521	93	18 33 65 280 298 522	94	280 369	97
	5.5					355 356 357 358 359 360 361 362 363 364 365 366 367 368 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 463 465 466 467 468 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 526	99
	7.0	73 74 113 138 190 287 289 295 301	101	133 143 156 181 182 185 243 296 299	102	81 353	104

Table 5 (continued)

Skill or Knowledge Category (abbreviated)	Scale Value	Level 1: Aide		Level 2: Technician		Level 3: Technologist	
		Task Codes	Curric. Ob.Nos.	Task Codes	Curric. Ob.Nos.	Task Codes	Curric. Ob.Nos.
Factors:		Patient Care (IV)				Rad. Technology (III)	
Figural Skills	1.0	262 271	106	308	107	372	109
	3.5					355 356 357 358 359 360 361 362 363 364 365 366 367 368 370 371 373 375 376 377 378 379 381 382 383 384 385 386 387 388 389 390 463 465 466 467 468 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 526	111
	5.0					81 374	112

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Table 5 (continued)

Skill or Knowledge Category (abbreviated)	Scale Value	Level 1: Aide		Level 2: Technician		Level 3: Technologist	
		Task Codes	Curric. Ob.Nos.	Task Codes	Curric. Ob.Nos.	Task Codes	Curric. Ob.Nos.
Factors:		Patient Care (IV)				Rad. Technology (III)	
Implicative Skills	1.0	262 271 283	119	33 65 133 143 156 181 182 185 299 308	120	370 371 372 373	123
	2.0	73 295	124	280	125	81 280 353 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 463 464 465 466 467 468 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 526	127
	5.0			296	128		

Table 5 (continued)

Skill or Knowledge Category (abbreviated)	Scale Value	Level 1: Aide Task Codes	Level 1: Aide Curric. Ob.Nos.	Level 2: Technician Task Codes	Level 2: Technician Curric. Ob.Nos.	Level 3: Technologist Task Codes	Level 3: Technologist Curric. Ob.Nos.
Factors:				Patient Care (IV)		Rad. Technology(III)	
Financial Consequences of Error	1.0	73 74 98 129 113 138 153 155 166 199 262 271 278 282 283 287 289 290 291 303		18 33 65 130 133 143 156 181 185 198 280 296 298 299 308 522		280 353 355 133 356 357 358 359 360 361 362 363 364 365 366 367 368 369 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 463 464 465 466 467 468 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 526	
	4.0					370 371 372 137 373	

Skill or Knowledge Category (abbreviated)	Scale Value	Level 1: Aide Task Codes	Level 1: Aide Curric. Ob.Nos.	Level 2: Technician Task Codes	Level 2: Technician Curric. Ob.Nos.	Level 3: Technologist Task Codes	Level 3: Technologist Curric. Ob.Nos.
Factors:		Patient Care (IV)				Rad. Technology (III)	
Consequences of Error To Humans	1.0	73 74 98 113 155 199 262 278 279 281 287 290 291 302 303 520	138	133 198	139	353	142
	2.0	193 283 289 292 301 490	144	18 156 182	145	466 468	147
	3.0	138 153 166 295	148	33 143 181 185 243	149	369 467	152
	5.5	190 282 521	153	65 280 296 298 299 522	154	81 280 355 356 357 358 359 362 364 371 377 378 379 381 382 384 385 386 514 516 526	157
	7.0	271	158	308	159	360 361 363 365 366 367 368 370 372 373 374 375 376 380 383 387 388 389 390 463 464 465 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 515 517 518 519	161

Table 5 (continued)

Skill or Knowledge Category (abbreviated)	Scale Value	Level 1: Aide		Level 2: Technician		Level 3: Technologist	
		Task Codes	Curric. Ob.Nos.	Task Codes	Curric. Ob.Nos.	Task Codes	Curric. Ob.Nos.
Factors:		Patient Care (IV)				Rad. Technology (III)	
11731200 Topographic anatomy	1.5	199 262 520	169	18 308	170	373	171
	2.5	193	172				
	3.5			133 296 299	173	355 356 357 358 359 360 361 362 363 364 365 366 367 368 370 371 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 463 465 466 467 468 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519	174
	5.5					374 523	175
	7.0					353	176

Table 5 (continued)

Skill of Knowledge Category (abbreviated)	Scale Value	Level 1: Aide		Level 2: Technician		Level 3: Technologist	
		Task Codes	Curric. Ob.Nos.	Task Codes	Curric. Ob.Nos.	Task Codes	Curric. Ob.Nos.
Factors:		Patient Care (IV)				Rad. Technology (III)	
11731400 Circulatory system (cardio-vascular, lymphatic)	1.5	262 520	178	18 308	179	362 376 494 502 504 509 510 511 512 513 514 515 516 517 518 519 526	180
	2.5			296	181		
11733600 Disorders of circulatory system	1.5	199 262 520	205	308	206	353 355 356 357 358 359 360 361 363 364 365 366 367 368 369 374 375 377 378 379 380 381 382 383 384 385 386 387 388 389 390 463 464 465 466 467 468 491 492 493 495 496 497 498 499 500 501 503 505 506 507 508 526	207
	2.5					362 376 494 502 504 509 510 511 512 513 514 515 516 517 518 519	208

Skill or Knowledge Category (abbreviated)		Scale Value	Level 1: Aide Task Codes	Level 1: Aide Curric. Ob.Nos.	Level 2: Technician Task Codes	Level 2: Technician Curric. Ob.Nos.	Level 3: Technologist Task Codes	Level 3: Technologist Curric. Ob.Nos.
Factors:			Patient Care (IV)				Rad. Technology (III)	
11737100	Bandages, dressings, tourniquets, splints	1.5	283 295	238	33 522	239	504 505 506 507 508 509 510 511 512 514 515 517 518	240
		2.5			156	241		
		3.5			296	242		
11737200	Hemorrhage, bleeding; their arrest	1.5	521	243	522	244		
		3.5			296	245		
11737300	Handling, transportation of sick, wounded	1.5	153 155 295	246				
		2.5	166 190 282	247	243	248	369	249
		3.5	193 199 283 490	250	156	251	370 371 464	252
		5.5			296	253	353 355 356 357 358 359 360 361 362 363 364 365 366 367 368 374 375 376 377 378 380 381 383 384 3 386 387 3 389 390 46 465 466 46 468 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 526	254

Table 5 (continued)

Skill or Knowledge Category (abbreviated)	Scale Value	Level 1: Aide Task Codes	Level 1: Aide Curric. Ob.Nos.	Level 2: Technician Task Codes	Level 2: Technician Curric. Ob.Nos.	Level 3: Technologist Task Codes	Level 3: Technologist Curric. Ob.Nos.
Factors:		Patient Care (IV)				Rad. Technology(III)	
11738000 Asepsis	1.5	193 290	265	18	266		
	2.5	153 283 295 521	268	33 522	269	355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 374 381 382 383 384	271
	3.5	166 490 520	272	65 133 143 156 181 296 299 308	273	353 370 371 372 373 375 376 377 378 379 380 385 386 387 388 389 390 463 464 465 466 467 468 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 526	274

Table 5 (continued)

Skill or Knowledge Category (abbreviated)	Scale Value	Level 1: Aide		Level 2: Technician		Level 3: Technologist	
		Task Codes	Curric. Ob.Nos.	Task Codes	Curric. Ob.Nos.	Task Codes	Curric. Ob.Nos.
Factors:		Patient Care (IV)				Rad. Technology (III)	
12210000 Radiobiology	1.5	520	275	308	276		
	2.5			280	278	280 369	280
	3.5					81 353 355 356 357 358 359 360 361 362 363 364 365 366 367 368 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 463 464 465 466 467 468 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 526	282

Skill or Knowledge Category (abbreviated)	Scale Value	Level 1: Aide Task Codes	Level 1: Aide Curric. Ob.Nos.	Level 2: Technician Task Codes	Level 2: Technician Curric. Ob.Nos.	Level 3: Technologist Task Codes	Level 3: Technologist Curric. Ob.Nos.
Factors:		Patient Care (IV)				Rad. Technology (III)	
12223000 Diagnostic radiography	2.5	73 74	285	65	286	369	289
	3.5					372 373 464	291
	5.5					355 356 357 358 359 360 361 362 363 364 365 366 367 368 370 371 374 375	293
						376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 463 465 466 467 468 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 526	
	7.0					81 353	294
Procedural Objective (task sequences and equipment not elsewhere covered)	-	73 74 98 346 113 138 153 155 166 190 193 199 262 271 278 279 281 282 283 287 289 290 291 292 295 301 302 303 490 520 521					
		Level 1 Patient Care curriculum ends here.					

Table 5 (continued)

Skill or Knowledge Category (abbreviated)	Scale Value	Level 1: Aide	Level 2: Technician		Level 3: Technologist	
		Not Required	Task Codes	Curric. Ob.Nos.	Task Codes	Curric. Ob.Nos.
Factors:			Patient Care (IV)		Rad. Technology (III)	
Leadership Skills	1.0		33	37		
	4.5		296	40		
Taxonomic Skills	2.0		296	116	81 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 463 464 465 466 467 468 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 526	118
11731500 Respiratory system	1.5				362 364 374 378 379 380 494 497 498 526	182
	2.5		296	183		
11731700 Urinary system	1.5				363 387 388 389 390 463 495 501 502 526	189
	2.5		143	190		
	3.5		181	191		
11734600 Burns	3.5		156	217		

Table 5 (continued)

Skill or Knowledge Category (abbreviated	Scale Value	Level 1: Aide	Level 2: Technician		Level 3: Technologist	
		Not Required	Task Codes	Curric. Ob.Nos.	Task Codes	Curric. Ob.Nos.
Factors:			Patient Care (IV)		Rad. Technology (III)	
11734800 Shock and trauma	1.5				369 463 464	218
	2.5				353 355 356 357 358 359 360 361 362 363 364 365 366 367 368 374 375 376 377 378	219
					379 380 381 382 383 384 385 386 387 388 389 390 465 466 467 468 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 526	
	3.5		296	220		
11735100 Operative procedures	1.5		65	222	371 379 464	223
11735400 Introductory procedures	1.5		18 65 182	225	353 377 378 380 382 383 385 386 387 388 389 390 463 497 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 526	227
	2.5		143 181	228	465	229
	3.5		133 296 299	230		
11735600 Suture	1.5		33	232		

Skill or Knowledge Category (abbreviated)	Scale Value	Level 1: Aide	Level 2: Technician		Level 3: Technologist	
		Not Required	Task Codes	Curric. Ob.Nos.	Task Codes	Curric. Ob.Nos.
Factors:			Patient Care (IV)		Rad. Technology (III)	
11737000 First aid and care	2.5				353 355 356 357 358 359 360 361 362 363 364 365 366 367 368 374 466 468	235
	3.5				509 510 511 512 513 514 515 516 517 519	236
	7.0		296	237		
11737400 Sprains, strains, fractures; their healing	1.5				363 364 367 368 369 374 375 376 378 379 380 381 382 383 384 385 386 387 388 389 390 463 464 465 466 467 468 495 497 498 499 500 501 502 503 504 505 506 508 509 510 511 512 513 514 515 516 517 518 519 526	255
	2.5				353 355 356 357 358 359 360 361 362 365 366 370 377 491 492 493 494 496 507	256
	3.5		296	257		
11737600 Resuscitation	7.0		296	258		

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Table 5 (continued)

Skill or Knowledge Category (abbreviated)		Scale Value	Level 1: Aide	Level 2: Technician		Level 3: Technologist	
			Not Required	Task Codes	Curric. Ob.Nos.	Task Codes	Curric. Ob.Nos.
Factors:				Patient Care (IV)		Rad. Technology (III)	
11737700	Wounds and their healing	1.5		522	259	353 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 463 464 465 466 467 468 491 492 493 494 495 496 497 498 499 500 501 502 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 526	260
		2.5		296	261	503	262
		3.5		156	263		
		5.5		33	264		
12300000	Pharmacology	1.5		133 198 298 299	295		
12331000	Drug toxicity, antidotal therapy	1.5				375 376 377 378 380 384 385 387 388 389	297
		2.5		133 198 298 299	298		
12332000	Drug idiosyncrasy, allergy pharmacogenetics	1.5				375 376 377 378 380 384 385 387 388 389	299
		2.5		33 133 198 298 299	300		
12334000	Drug tolerance, physical dependence	2.5		133 299	301		

Table 5 (continued)

Skill or Knowledge Category (abbreviated)		Scale Value	Level 1: Aide Not Required	Level 2: Technician Task Codes	Level 2: Technician Curric. Ob.Nos.	Level 3: Technologist Task Codes	Level 3: Technologist Curric. Ob.Nos.
Factors:				Patient Care (IV)		Rad. Technology (III)	
12335000	Drug synergism	2.5		133 198 298 299	302		
12336000	Chemical teratogenesis	2.5		133 299	303		
12341100	Antibacterial, antifungal chemotherapy	2.5		198 298	304		
		3.5		33 133 299	305		
12341300	Cancer and virus chemotherapy	2.5		198 298	306		
		3.5		133 299	307		
12342100	Drugs acting on cardiovascular system, smooth muscle	1.5		296	308		
		2.5		198 298	309		
		3.5		133 299	310		
12342200	Drugs acting on the blood	2.5		198 298	311		
		3.5		133 299	312		
12342300	Hormones, drugs acting on endocrin glands, accessory reproductive organs	2.5		198 298	313		
		3.5		133 299	314		
12342600	Drugs for allergy, cough, vomiting	2.5		198 298	315		
		3.5		133 299	316		
12342700	Drugs acting on gastrointestinal tract	2.5		198 298	317		
		3.5		133 299	318		
12342810	Drugs acting on autonomic nervous system	2.5		198 298	319		
		3.5		133 299	320		
12342820	Drugs acting on neuromuscular system	2.5		198 298	321		
		3.5		133 299	322		

Table 5 (continued)

Skill or Knowledge Category (abbreviated)	Scale Value	Level 1: Aide	Level 2: Technician		Level 3: Technologist	
		Not Required	Task Codes	Curric. Ob.Nos.	Task Codes	Curric. Ob.Nos.
Factors:			Patient Care (IV)		Rad. Technology (III)	
12342830 Drugs acting on central nervous system	1.5				353 355 356 357 358 359 360 361 362 363 364 365 366 374 375 376 377 378 379 380 386 388 389 390 465 467 491 492 493 494 495 496 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 526	323
	2.5		198 298	324		
	3.5		133 299	325		
12342900 Drugs acting on immunologic system	2.5		198 298	326		
	3.5		133 299	327		
15222500 Interaction with radiation	1.5		280	329	280 353 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 463 464 465 466 467 468 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 526	331

Table 5 (continued)

Skill or Knowledge Category (abbreviated)	Scale Value	Level 1: Aide	Level 2: Technician		Level 3: Technologist	
		Not Required	Task Codes	Curric. Ob.Nos.	Task Codes	Curric. Ob.Nos.
Factors:			Patient Care (IV)		Rad. Technology (III)	
65620000 Mechanics of writing	1.5		33 156 182	342		
English	2.5				81 353 355 356 357 358 359 360 361 362 363 364 365 366 367 368 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 463 464 465 466 467 468 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 526	344
Procedural Objective (task sequences and equipment not elsewhere covered)	-		18 33 65 133 143 156 181 182 185 198 243 280 296 298 299 308 522	347		
			Level 2 Patient Care curriculum ends here.			

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Skill or Knowledge Category (abbreviated)		Scale Value	Level 1: Aide Not Required	Level 2: Tecn. Not Required	Level 3: Technologist Task Codes	Curric. Ob.Nos.
Factors:					Radiologic Technology (III)	
11731000	Normal structure and function	2.5			353 362 363 368 371 376 378 381 382 383 384 385 386 387 388 389 390 463 465 496 500 501 502 503 511 512 513 515 516 518 519	162
11731100	Regional anatomy	2.5			372 464	163
		3.5			355 356 357 358 359 360 361 362 363 364 365 366 367 368 370 371 373 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 463 465 466 467 468 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519	165
		5.5			81 374 526	167
		7.0			353	168
11731300	Hematopoietic system	1.5			516	177
11731600	Digestive system	1.5			363 374 495 526	184
11731610	Mouth, pharynx, esophagus	1.5			364 374 375 381 494 499	185
11731620	Stomach, small intestine	1.5			381 382 499 501	186
11731630	Large intestine, rectum	1.5			383 500 501	187
11731640	Liver, biliary system, pancreas	1.5			371 384 385 386 387	188

Table 5 (continued)

Skill or Knowledge Category (abbreviated)	Scale Value	Level 1: Aide Not Required	Level 2: Tecn. Not Required	Level 3: Technologist Task Codes	Curric. Ob.Nos.
Factors:				Radiologic Technology (III)	
11731800 Musculoskeletal system	2.5			355 356 357 358 359 360 361 362 363 364 365 366 367 368 370 375 376 377 378 379 380 381 382 383 387 388 389 390 463 465 466 467 468 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519	192
	3.5			374 526	193
	5.5			81 353	194
11731820 Bones and joints	2.5			363 364 367 375 376 378 379 380 381 382 383 387 388 389 390 463 465 466 467 468 495 497 498 499 500 501 502 503 504 505 506 508 509 510 511 512 513 514 515 516 517 518 519	195
	3.5			355 356 357 358 359 360 361 362 365 366 370 374 377 491 492 493 494 496 507 526	196
	7.0			353	197
11731910 Central nervous system	1.5			374 504 505 506 507 508 509 526	198
11731943 Eye and optic nerve	1.5			367	199
11732222 Male reproductive system	1.5			374 503 526	200
11732223 Female reproductive system	1.5			374 465 466 467 468 503 512 526	201

Skill or Knowledge Category (abbreviated)	Scale Value	Level 1: Aide Not Required	Level 2: Tecn. Not Required	Level 3: Technologist Task Codes	Curric. Ob.Nos.
Factors:				Radiologic Technology (III)	
11733200 Neoplasms (cancerous growths)	1.5			353 362 363 364 366 368 374 375 376 378 379 380 381 382 383 384 385 386 387 388 389 390 463 465 494 495 498 499 500 501 502 504 505 506 508 509 511 512 514 515 516 518 526	202
11733400 Disorders of blood, blood-forming organs	1.5			516	203
11733510 Disorders of central nervous system	1.5			504 505 506 507 508 509	204
11733700 Disorders of digestive system	1.5			363 371 375 381 382 383 384 385 386 387 495 499 500 501	209
11733800 Disorders of respiratory system	1.5			353 355 356 357 358 359 360 361 363 364 365 366 367 368 369 375 376 377 381 382 383 384 385 386 387 388 389 390 463 464 465 466 467 468 491 492 493 495 496 497 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 526	210
	2.5			362 374 378 379 380 494 498	211
11733900 Disorders of uro-genital system	1.5			363 387 388 389 390 463 465 466 495 501 502 512	212

Table 5 (continued)

Skill or Knowledge Category (abbreviated)		Scale Value	Level 1: Aide Not Required	Level 2: Tecn. Not Required	Level 3: Technologist Task Codes	Curric. Ob.Nos.
Factors:					Radiologic Technology (III)	
11734200	Disorders of musculoskeletal system	1.5			363 364 367 369 370 374 375 376 378 379 380 381 382 383 384 385 386 387 388 389 390 463 464 465 466 467 468 495 497 498 499 500 501 502 503 504 505 506 508 509 510 511 512 513 514 515 516 517 518 519 526	213
		2.5			353 355 356 357 358 359 360 361 362 365 366 368 377 491 492 493 494 496 507	214
11734300	Congenital abnormalities	1.5			380 496 497 499 500 501 502 503	215
11734400	Disorders, complications of pregnancy, birth	1.5			466 467 468 512	216
11735000	Surgery	1.5			372 373	221
11735300	Repair surgery	1.5			370	224
11735500	Endoscopy	1.5			379	231
11735800	Delivery methods for child-birth	1.5			466 468	233
11736000	Anesthesiology	1.5			370 371 372 373 463 498 511 513 514 516 518 519 526	234
33000000	Computer technology	1.5			526	336
41666700	Death and dying behavioral development	1.5			353 362 363 364 365 366 368 374 376 378 381 382 383 385 386 387 388 389 390 463 465 498 499 500 501 502 504 505 506 508 509 511 512 513 514 515 516 517 518 519 526	337

Table 5 (continued)

Skill or Knowledge Category (abbreviated)	Scale Value	Level 1: Aide	Level 2: Tecn.	Level 3: Technologist	
		Not Required	Not Required	Task Codes	Curric. Ob.Nos.
Factors:				Radiologic Technology (III)	
Symbolic Skills	1.5			355 356 357 358 359 360 361 362 363 364 365 366 367 368 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 463 464 465 466 467 468 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519	115
51200000 Algebra	1.5			355 356 357 358 359 360 361 362 365 375 491 492 493 494 495 496 511 518	339
Procedural Objective (task sequences and equipment not elsewhere covered)	-			81 280 353 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 463 464 465 466 467 468 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 526	350
				Level 3 Radiologic Technologist curriculum ends here.	

APPENDIX D

EXAMPLES OF HSMS CURRICULUM OBJECTIVES

Skill Objectives. D-1
Selected Knowledge Category Objectives. D-47
Selected Procedural Objectives. D-63

Curriculum Objective Name		Scale Value	Curriculum Objective No.
Object Manipulation Skills		1.5	1
		3.5	7
Guiding or Steering Skills		3.0	19
Human Interaction Skills		3.0	26, 29
		5.0	32, 33
Leadership Skills		4.5	41*
Oral Use of a Relevant Language		4.0	47, 48
Reading Use of a Relevant Language		2.0	54, 55
		5.0	62
Written Use of a Relevant Language		2.0	67
Decision Making on Methods		3.0	78, 80
		4.5	83
Decision Making on Quality		1.5	87
		7.0	101, 102, 103
Figural Skills		1.0	108
Symbolic Skills		1.5	115*
Taxonomic Skills		2.0	118*
Implicative Skills		1.0	120, 122
		2.0	126*
Financial Consequences of Error		1.0	129, 132
Consequences of Error to Humans		1.0	138
		2.0	145
		3.0	148
		5.5	156
11731000	Normal structure and function	2.5	162*
11731100	Regional anatomy	3.5	165*
11731200	Topographic anatomy	3.5	174*
11735400	Introductory procedures	1.5	225
11737300	Handling and transportation of	1.5	246
	the sick or wounded	5.5	254*
11738000	Asepsis	2.5	268
12210000	Radiobiology	2.5	279
12223000	Diagnostic radiography	2.5	285
15222500	Interaction with radiation	1.5	330
65620000	Mechanics of writing English	1.5	342, 343
Procedural Objective		-	346, 347, 349

* Task Description Annotation Sheets for these Objectives appear in Appendix B except for those marked with asterisk. All task descriptions appear in Research Report No. 7, Volumes 2 or 3. Curriculum Objectives are taken from Research Report No. 8, Volume 2.

CURRICULUM OBJECTIVE SHEET

Type of Objective Skill Factor IV No. 1
Skill or Knowledge Category Object Manipulation Skills Scale Value 1.5
Occupation Patient Care Aide Level 1
Refers to Task Code No(s).: 98 153 166 199 262 283 292 301 302 303 520 521

Is there Cross Reference? ...Yes(X) ...No( ) If yes, see footnote(s).

Content: A graduate of the program at this educational level must be able to achieve the degree of control and precision in the manipulation of objects with the fingers, hands, or limbs with the fineness of motion appropriate to achieving the standards set for manipulation of objects in the following activities:

1. Attaching and/or removing self-adhesive urine bag; attaching label (Task 98).

→ 2. Using restraints to immobilize patient (Task 153).

3. Putting on sterile mask, gown and gloves for isolation or decontamination procedures; tying to fasten (Task 166).

4. Using sphygmomanometer to take blood pressure (Task 199).

5. Using controls to standardize ECG machine (Task 262).

6. Applying gauze pad to wound; cutting strips of adhesive; applying tape to gauze and skin (Task 283).

7. Taking small specimen of feces from container using rubber gloves and tongue depressor; placing into laboratory container (Tasks 292, 303).

8. Folding diaper; pinning into place on neonate or infant (Task 301).

9. Using wheelchair controls (Task 302).

10. Attaching ECG electrodes with clamp to amputee (Task 520).

11. Touching clot using sterile technique to judge whether it is hard; using marker to circle swelling or evidence of blood accumulation beneath skin (Task 521).

To accomplish this, the student must be able to state what standards of precision must be achieved for each activity, and must be able to exercise the degree of control and precision necessary to achieve the standards.

Cross Reference Footnotes: See The Following Curriculum Objectives:
Same scale value appears in: 2 3 4 5.
Higher scale value appears in: 6 7 8 9 10 11 12 13.

CURRICULUM OBJECTIVE SHEET

Type of Objective Skill Factor IV No. 7
Skill or Knowledge Category Object Manipulation Skills Scale Value 3.5
Occupation Patient Care Technician Level 2
Refers to Task Code No(s).: 156 182 185 243

Is there Cross Reference? ...Yes(X) ...No( ) If yes, see footnote(s).

Content: A graduate of the program at this educational level must be able to achieve the degree of control and precision in the manipulation of objects with the fingers, hands, or limbs with the fineness of motion appropriate to achieving the standards set for manipulation of objects in the following activities:

1. Applying sterile gauze, pads, vaseline gauze to wound or burn using sterile techniques, forcers; applying tape; wrapping bandage; applying sling (Task 156).

→ 2. Inserting suction catheter in tracheostomy; using catheter and controls to remove mucous from passageway; removing catheter (Task 182).

3. In checking oxygen equipment and administering oxygen, adjusting cylinder valve; connecting regulator; setting pressure and/or flow rate valve (Task 185).

4. Tying down hands, limbs, or body of patient needing restraining with gauze, foam pads, cloth tape, rolled sheets, special restraints; attaching restraints to bed, wheelchair, etc. (Task 243).

To accomplish this, the student must be able to state what standards of precision must be achieved for each activity, and must be able to exercise the degree of control and precision necessary to achieve the standards.

Cross Reference Footnotes: See The Following Curriculum Objectives:
Lower scale value appears in: 1 2 3 4 5.
Same scale value appears in: 6 8 9 10 and levels 4 and 5.
Higher scale value appears in: 11 12 13.

CURRICULUM OBJECTIVE SHEET

Type of Objective Skill Factor IV No. 19
Skill or Knowledge Category Guiding or Steering Skills Scale Value 3.0
Occupation Patient Care Technician Level 2
Refers to Task Code No(s).: (182) 185

Is there Cross Reference? ...Yes(X) ...No( ) If yes, see footnote(s).

Content: A graduate of the program at this educational level must be able to coordinate his or her perception of external stimuli which inform him or her of his or her position in order to control an object being moved over a predetermined pathway in the following activities so as to achieve the degree of precision necessary to accomplish the objective within an acceptable margin of error:

→ 1. Wheeling patient in stretcher or wheelchair into position to receive suction, gastric lavage or oxygen, taking care that patient is not jostled (Tasks 182, 185).

To accomplish this, the student must be able to state what external stimuli must be attended to, what coordination is required, and what margin of error is allowable in the movement of the object to achieve the standards.

Cross Reference Footnotes: See The Following Curriculum Objectives:
Lower scale value appears in: 14 15 16 17.
Same scale value appears in: 18 and level 4 of patient care.

Type of Objective Skill Factor IV No. 26
Skill or Knowledge Category Human Interaction Skills Scale Value 3.0
Occupation Patient Care Aide Level 1
Refers to Task Code No(s).: (74) 98 113 155 193 262 271 282 283 287 289 292 295 301 302 303 520 521

Is there Cross Reference? ...Yes(X) ...No( ) If yes, see footnote(s).

Content: A graduate of the program at this educational level must be able to exercise sensitivity to others, and be sufficiently perceptive of the relevant characteristics or state of being of other people in the following activities to be able to pay attention to feedback in interaction, and adjust his or her behavior as appropriate to accomplish the purpose of the tasks in which the interactions occur. These activities include:

1. Explaining to patient or family member what must be done or not done at home before patient comes for next appointment for radiography; checking that this is understood; explaining reasons, nature of examination, how to prepare (Task 74).

2. Encouraging pediatric patient to urinate (Task 98).

3. Giving comfort and moral support to patient; explaining about institution (Task 113).

4. Explaining to patient how to provide urine specimen, or to family member how to obtain specimen from child (Task 155).

5. Questioning patient to learn whether pre-examination procedures have been carried out (Task 193).

6. Explaining ECG procedures to patient or accompanying adult (Tasks 262, 520).

7. Without alarming patient with irregular ECG reading, making patient comfortable; noting whether patient is in distress; notifying appropriate physician (Task 271).

8. Escorting adult out-patients to and/or from dressing, waiting, or procedure rooms; explaining what clothing to remove; assisting if needed (Task 282).

9. Explaining to patient what will be done if dressing needs changing or reinforcing (Task 283), or puncture site requires manual pressure (Task 521).

10. Judging whether patient needs to be fed; feeding patient or assisting (Task 287).

11. Bottle feeding an infant or neonate (Task 289).

12. Encouraging pediatric patient to evacuate (Task 292).

Type of Objective Skill Factor IV No. 26
Skill or Knowledge Cagegory Human Interaction Skills Scale Value 3.0

Content Continued

13. Asking questions, raising issues, participating in discussions at meeting of nursing personnel in x-ray department (Task 295).

14. Diapering a baby (Task 301).

15. Determining from patient contents of message to be delivered by performer or information to be obtained; explaining why medical information cannot be relayed; placing call; relaying message; relaying return message (Task 302).

16. Explaining to patient how to note time and amount of urine passed, or feces evacuated (Task 303).

To accomplish this, the student must be able to demonstrate sufficient awareness of what the relevant characteristics are of the "other" in the given situation, must be able to demonstrate sufficient perception of the feedback from the "other," and must be able to indicate what the proper adjustment must be in his or her behavior to accomplish the activities which engendered the interaction,and do this at the quality standard set.

Cross Reference Footnotes: See The Following Curriculum Objectives:
Lower scale value appears in: 20 21 22 23 24 25.
Same scale value appears in: 27 28 29 30 31.
Higher scale value appears in: 32 33 34 35 36.

CURRICULUM OBJECTIVE SHEET

Type of Objective Skill Factor VI No. 29
Skill or Knowledge Category Human Interaction Skills Scale Value 3.0
Occupation Quality Assurance Technician Level 2
Refers to Task Code No(s).: 175 280 529 530 531 532 533 535 537 539 540 543 544 545 548 549 550

Is there Cross Reference? ...Yes(X) ...No( ) If yes, see footnote(s).

Content: A graduate of the program at this educational level must be able to exercise sensitivity to others, and be sufficiently perceptive of the relevant characteristics or state of being of other people in the following activities to be able to pay attention to feedback in interaction, and adjust his or her behavior as appropriate to accomplish the purpose of the tasks in which the interactions occur. These activities include:

1. Discussing with radiologist changes in kilovoltage settings to compensate for declining density in radiographs; obtaining instructions or opinions (Task 175).

2. Discussing possible causes for unusually high radiation exposure reading of performer's own radiation detection dosimeter and possible transfer to other work (Task 280).

3. Discussing results of test of x-ray equipment with supervisor and/or radiologist in charge,including effect of problem or deviations from acceptable standards on patient exposure, diagnostic reliability, legal requirements (Tasks 529, 530, 531, 532, 533, 535, 537, 539, 540, 548, 549).

4. Suggesting set-up and check procedures to staff using x-ray film processors,and discussing with appropriate staff member(s) (Task 543).

5. Discussing results of test to determine exposure characteristics of x-ray films with appropriate staff members (Task 544).

6. Discussing results of patient exposure rate monitoring and radiation protection survey with supervisor or radiologist,such as effect of deviations from acceptable standards on exposure levels, diagnostic reliability, safety requirements (Tasks 545, 550).

To accomplish this, the student must be able to demonstrate sufficient awareness of what the relevant characterisitcs are of the "other" in the given situation, must be able to demonstrate sufficient perception of the feedback from the "other," and must be able to indicate what the proper adjustment must be in his or her behavior to accomplish the activities which engendered the interaction,and do this at the quality standard set.

Cross Reference Footnotes: See The Following Curriculum Objectives:
Lower scale value appears in: 20 21 22 23 24 25.
Same scale value appears in: 27 28 30 31.
Higher scale value appears in: 32 33 34 35 36.

Type of Objective Skill Factor IV No. 32
Skill or Knowledge Category Human Interaction Skills Scale Value 5.0
Occupation Patient Care Aide Level 1
Refers to Task Code No(s).: 73 138 153 290 490

Is there Cross Reference? ...Yes(X) ...No( ) If yes, see footnote(s).

Content: A graduate of the program at this educational level must be able to exercise sensitivity to others, and be sufficiently perceptive of the relevant characteristics or state of being of other people in the following activities to be able to pay attention to feedback in interaction, and adjust his or her behavior as appropriate to accomplish the purpose of the tasks in which the interactions occur. These activities include:

1. Reassuring patient and/or accompanying adult about procedures; explaining what will happen; helping to calm or comfort patient and/or adult by being sympathetic and behaving in an interested and professional manner (Tasks 73, 153, 290, 490).

2. Noting, while interacting with patient, conditions, symptoms, or behavior which should be brought to physician's attention; noting whether, in conversation, patient mentions symptoms, or worries, or concerns related to health which should be told to physician to aid in caring for patient (Task 138).

To accomplish this, the student must be able to demonstrate sufficient awareness of what the relevant characteristics are of the "other" in the given situation, must be able to demonstrate sufficient perception of the feedback from the "other," and must be able to indicate what the proper adjustment must be in his or her behavior to accomplish the activities which engendered the interaction, and do this at the quality standard set.

Cross Reference Footnotes: See The Following Curriculum Objectives:
Lower scale value appears in: 20 21 22 23 24 25 26 27 28 29 30 31.
Same scale value appears in: 33 34 35.
Higher scale value appears in: 36.

Type of Objective Skill Factor IV No. 33
Skill or Knowledge Category Human Interaction Skills Scale Value 5.0
Occupation Patient Care Technician Level 2
Refers to Task Code No(s).: 143 181 182 185 243

Is there Cross Reference? ...Yes(X) ...No( ) If yes, see footnote(s).

Content: A graduate of the program at this educational level must be able to exercise sensitivity to others, and be sufficiently perceptive of the relevant characterisitcs or state of being of other people in the following activities to be able to pay attention to feedback in interaction, and adjust his or her behavior as appropriate to accomplish the purpose of the tasks in which the interactions occur. These activities include:

1. In catheterization of male or female urethra, explaining what will be done and what patient will experience; reassuring, especially pediatric patient (Task 143, 181).

2. In clearing tracheostomy passage with suction machine, reassuring or comforting patient during process; determining whether passage has been cleared (Task 182).

3. In administering oxygen, observing patient to make sure patient is responding; reassuring patient; helping to relieve coughing; keeping patient relaxed (Task 185).

4. Trying to reassure and calm a patient who is being restrained (Task 243).

To accomplish this, the student must be able to demonstrate sufficient awareness of what the relevant characteristics are of the "other" in the given situation, must be able to demonstrate sufficient perception of the feedback from the "other," and must be able to indicate what the proper adjustment must be in his or her behavior to accomplish the activities which engendered the interaction,and do this at the quality standard set.

Cross Reference Footnotes: See The Following Curriculum Objectives:
Lower scale value appears in: 20 21 22 23 24 25 26 27 28 29 30 31.
Same scale value appears in: 32 34 35.
Higher scale value appears in: 36.

CURRICULUM OBJECTIVE SHEET

Type of Objective Skill Factor A No. 41
Skill or Knowledge Category Leadership Skills Scale Value 4.5
Occupation Administrative Technologist Level 3
Refers to Task Code No(s).: 131

Is there Cross Reference? ...Yes(X) ...No( ) If yes, see footnote(s)

Content: A graduate of the program at this educational level must be able to indicate the extent to which he or she is called on to provide leadership to subordinates (in line relation or de facto) so as to influence their work behavior, in order to accomplish work objectives such as the following:

1. Obtaining staff preferences on work, vacation, days off, lunch and break time preferences; assigning and informing staff of scheduled assignments; making reassignments as needed (Task 131).

To accomplish this, the student must be able to state what power he or she has over the subordinates' conditions of employment (hiring, firing, promotions, raises, transfers, overtime, special privileges) in this situation; indicate how less leadership is needed the greater the power; and state what can be done to reduce or increase the need for leadership.

The student must be able to state what channels of communication exist for giving orders in this situation, for receiving or giving information, for the evaluation of and for exercising discipline over the subordinates; indicate how less leadership is needed the more precisely known and formalized these channels are; and state what can be done to reduce or increase the need for leadership.

The student must be able to state the degree to which the tasks of subordinates which are to be accomplished are clearly defined and understood by the subordinates in this situation; indicate how less leadership is needed the clearer the subordinates' own tasks are to them; and state what can be done to reduce or increase the need for leadership.

Cross Reference Footnotes: See The Following Curriculum Objectives:
Lower scale value appears in: 37 38 39.
Same scale value appears in: 40 and level 4.

Type of Objective Skill Factor IV No. 47
Skill or Knowledge Category Oral Use of a Relevant Language Scale Value 4.0
Occupation Patient Care Aide Level 1
Refers to Task Code No(s).: 73 74 98 113 138 153 155 193 199 262 278 282 290 292 295 302 303 520 521

Is there Cross Reference? ...Yes(X) ...No( ) If yes, see footnote(s).

Content: A graduate of the program at this educational level must be able to communicate orally (in an appropriate language) and comprehend what is said in that language with a sufficient degree of precision to accomplish the following activities by expressing or comprehending meaning with the degree of precision needed:

1. Explaining what will happen during procedure to patient and/or accompanying adult using language understandable to the persons involved; explaining use of equipment or materials (Tasks 73, 98, 113, 153, 155, 262, 282, 290, 292, 303, 520, 521).

2. Explaining to patient or family member the procedures to be carried out at home before patient arrives for radiography; explaining what will happen; checking that patient or family member understands (Task 74).

3. In conversation with patient, noting whether patient mentions symptoms or worries related to health, or concerns which would indicate information helpful to physician in caring for patient; reporting to physician or appropriate staff member (Task 138).

4. Questioning patient to learn whether pre-examination procedures have been carried out (Task 193).

5. Questioning patient or accompanying adult to learn whether a condition exists precluding use of an oral thermometer with patient (Task 199).

6. Asking ward or floor supervisor about nonappearance of patients for examination; requesting that such instances be avoided; suggesting early notification of cancellations (Task 278).

7. Participating in meeting of nursing personnel assigned to x-ray department; raising questions about work, rules, regulations, new equipment, problems of patient care; participating in discussions (Task 295).

8. Making a telephone call on behalf of patient; relaying patient's message; taking return message (Task 302).

To accomplish this, the student must be able to deal with the nuances of oral language with sufficient precision to use the words needed correctly in context, or grasp the meaning (or question a speaker about intended meaning), so that the activities involved can be accomplished satisfactorily.

Cross Reference Footnotes: See The Following Curriculum Objectives:
Lower scale value appears in: 42 43 44 45 46.
Same scale value appears in: 48 49 50 51 52.
Higher scale value appears in: 53.

Type of Objective Skill Factor IV No. 48
Skill or Knowledge Category Oral Use of a Relevant Language Scale Value 4.0
Occupation Patient Care Technician Level 2
Refers to Task Code No(s).: 18 33 65 133 143 156 181 182 185 198 243 280 296 298 299 522

Is there Cross Reference? ...Yes(X) ...No( ) If yes, see footnote(s).

Content: A graduate of the program at this educational level must be able to communicate orally (in an appropriate language) and comprehend what is said in that language with a sufficient degree of precision to accomplish the following activities by expressing or comprehending meaning with the degree of precision needed:

1. Explaining to patient what will be done in drawing blood (Task 18), removing sutures (Task 33), using suction machine (Task 182), administering oxygen (Task 185), applying pressure dressing (Task 522).

2. Discussing timing of specimen-taking procedures with physician so that performer may receive body fluid, washings, and/or cell or tissue biopsies and prepare them for transportation to laboratory (Task 65).

3. Explaining name and purpose of medication and possible side effects; asking about patient's allergies; reporting contraindications to physician (Tasks 133, 198, 298, 299).

4. Explaining catheterization procedure to patient; reporting to physician reason for terminating if there is severe pain or blockage (Tasks 143, 181).

5. Telling physician if patient's wound or opening appears suspicious or if performer is unsure how to irrigate, medicate or dress (Task 156).

6. Explaining to staff member need for restraining patient, and asking why this was not done beforehand (Task 243).

7. Discussing possible reasons for unusually high radiation exposure reading on performer's radiation detection device; discussing possible transfer of work (Task 280).

8. Determining from co-workers information about a patient and the situation involved in a possible emergency; when physician arrives, reporting what has happened and what emergency care has been administered (Task 296).

To accomplish this, the student must be able to deal with the nuances of oral language with sufficent precision to use the words needed correctly in context, or grasp the meaning (or question a speaker about intended meaning), so that the activities involved can be accomplished satisfactorily.

Cross Reference Footnotes: See the Following Curriculum Objectives:
Lower scale value appears in: 42 43 44 45 46.
Same scale value appears in: 47 49 50 51 52 and level 4 of patient care.
Higher scale value appears in 53.

CURRICULUM OBJECTIVE SHEET

Type of Objective Skill Factor VI No. 50

Skill or Knowledge Category Oral Use of a Relevant Language Scale Value 4.0

Occupation Quality Assurance Technician Level 2

Refers to Task Code No(s).: 175 280 527 529 530 531 532 533 535 537 539 540 543 544 545 548 549 550

Is there Cross Reference? ...Yes(X) ...No( ) If yes, see footnote(s).

Content: A graduate of the program at this educational level must be able to communicate orally (in an appropriate language) and comprehend what is said in that language with a sufficient degree of precision to accomplish the following activities by expressing or comprehending meaning with the degree of precision needed:

1. Discussing possible changes in technique charts for specific x-ray machines based on results of penetrometer calibration test of kVp and mA selectors (Task 175).

2. Discussing possible reasons for unusually high radiation exposure reading on performer's radiation detection device; discussing possible transfer of work (Task 280).

3. In retrieving computerized transverse axial scans, discussing incomplete or unclear information on requisition with appropriate staff; explaining display options (Task 527).

4. Discussing results of tests of x-ray or film processing equipment, radiation survey, or radiation monitoring results with supervisor or radiologist; explaining effect of problems and deviations from acceptable standards in terms of patient exposure, diagnostic reliability, legal requirements (Tasks 529, 530, 531, 532, 533, 535, 537, 539, 540, 543, 545, 548, 549, 550).

5. Discussing results of test of exposure characteristics of x-ray or dosimetric films and making suggestions on the disposition of the films (Task 544).

To accomplish this, the student must be able to deal with the nuances of oral language with sufficient precision to use the words needed correctly in context, or grasp the meaning (or question a speaker about intended meaning), so that the activities involved can be accomplished satisfactorily.

Cross Reference Footnotes: See The Following Curriculum Objectives:
Lower scale value appears in: 42 43 44 45 46.
Same scale value appears in: 47 48 49 51 52.
Higher scale value appears in 53.

Type of Objective Skill Factor IV No. 54
Skill or Knowledge Category Reading Use of a Relevant Language Scale Value 2.0
Occupation Patient Care Aide Level 1
Refers to Task Code No(s).: (74) 98 (153) 155 166 190 193 199 262 278 279 281 287 289 290 301 302 303 520

Is there Cross Reference? ...Yes(X) ...No( ) If yes, see footnote(s).

Content: A graduate of the program at this educational level must be able to read and comprehend the meaning of any printed or written material (in an appropriate language) with a sufficient degree of precision to accomplish the following activities, based on the preciseness of comprehension of the materials read:

1. Reading physician's orders, patient checklist, or requisition sheet for instructions or details on procedure ordered for patient, what materials to use, or how to proceed with patient in task (Tasks 74, 98, 166, 193, 199, 262, 287, 289, 301, 303, 520).

2. Reading labels on packaged materials or equipment in order to check for presence of appropriate materials or to select appropriate materials for use in task (Tasks 153, 290).

3. Preparing and/or checking identifying labels or checking patient's identity or location by reading patient identification information on requisition sheet and/or on patient's ID bracelet (Tasks 155, 190, 281, 289).

4. Reading schedule and identifying the names of patients scheduled for procedures; reading names so as to place telephone call (Tasks 278, 279, 302).

Cross Reference Footnotes: See The Following Curriculum Objectives:
Same scale value appears in: 55 56 57 58 59.
Higher scale value appears in: 60 61 62 63.

CURRICULUM OBJECTIVE SHEET

Type of Objective Skill Factor IV No. 55
Skill or Knowledge Category Reading Use of a Relevant Language Scale Value 2.0
Occupation Patient Care Technician Level 2
Refers to Task Code No(s).: 18 65 133 143 156 181 (182) 185 198 296 298 299 308 522

Is there Cross Reference? ...Yes(X) ...No( ) If yes, see footnote(s).

Content: A graduate of the program at this educational level must be able to read and comprehend the meaning of any printed or written material (in an appropriate language) with a sufficient degree of precision to accomplish the following activities, based on the preciseness of comprehension of the materials read:

1. Reading physician's orders, patient checklist, or requisition sheet for instructions or details on procedure for patient, what materials to use, how to proceed with patient in task, quantities ordered (Tasks 18, 65, 133, 143, 156, 181, 182, 198, 298, 299, 308).

2. Reading labels on packaged materials, supplies, or equipment in order to check for presence of appropriate materials or to select appropriate materials to use in task (Tasks 133, 156, 185, 198, 296, 298, 299, 522).

Cross Reference Footnotes: See The Following Curriculum Objectives:
Same scale value appears in: 54 56 57 58 59.
Higher scale value appears in: 60 61 62 63.

CURRICULUM OBJECTIVE SHEET

Type of Objective Skill Factor VI No. 62

Skill or Knowledge Category Reading Use of a Relevant Language Scale Value 5.0

Occupation Quality Assurance Technician Level 2

Refers to Task Code No(s).: 276 280 523 524 525 527 529 530 531 532 (533) 535 537 538 539 540 543 544 545 548 549 550 553 554 556

Is there Cross Reference? ...Yes(X) ...No( ) If yes, see footnote(s).

Content: A graduate of the program at this educational level must be able to read and comprehend the meaning of any printed or written material (in an appropriate language) with a sufficient degree of precision to accomplish the following activities, based on the preciseness of comprehension of the materials read:

1. Reading manufacturer's directions on preparing refills of developer and/or fixer for automatic x-ray film processors (Task 276).

2. Reading letter informing performer of unusually high monthly radiation exposure or of high cumulative exposure and/or requesting presence at an interview (Task 280).

3. Reading operator's manual in connection with problems in preparation, maintenance, check of calibration, or operation of retrieval functions of computerized transverse axial tomography equipment (Tasks 523, 524, 525, 527).

4. Reading standard test procedures, government standards, test forms and records, and manufacturers' specifications in connection with tests of diagnostic radiography equipment, film processors, film batches, radiation surveys, and radiation monitoring (Tasks 529, 530, 531, 532, 533, 535, 537, 538, 539, 540, 543, 544, 545, 548, 549, 550).

5. Reading descriptions of steps to be followed in calibrating, processing, reading, and recording radiation exposure in connection with dosimetric films or thermoluminescent dosimeters (Task 553).

6. Reading instructions for entering, evaluating, and reporting personnel radiation exposure data and initiating action on dangerous levels (Task 554).

7. Reading instructions on how to calibrate radiation exposure detection instruments and/or electrical measuring instruments, densitometers, sensitometers and other test instruments (Task 556).

Cross Reference Footnotes: See The Following Curriculum Objectives:
Lower scale value appears in: 54 55 56 57 58 59.
Same scale value appears in: 60 61 63.
Higher scale value appears in level 5.

CURRICULUM OBJECTIVE SHEET

Type of Objective Skill Factor VI No. 67
Skill or Knowledge Category Written Use of a Relevant Language Scale Value 2.0
Occupation Quality Assurance Technician Level 2
Refers to Task Code No(s).: 173 175 178 187 276 525 529 530 531 532 533 534 535 536 537 538 539 540 543 544 545 548 549 556

Is there Cross Reference? ...Yes(X) ...No( ) If yes, see footnote(s).

Content: A graduate of the program at this educational level must be able to convey meaning by writing or dictating (in an appropriate language) with a sufficient degree of precision in the words, sentences, and/or paragraphs formed to accomplish the following activities, based on the clarity of meaning conveyed in the materials written or dictated:

1. Writing instructions for compensations to be made for inaccuracy of exposure controls such as timer, kVp or mA selectors, or making changes on technique charts (Tasks 173, 175).

2. Recording results of equipment test or radiation monitoring tests, description of any problem or damage, or evaluation of test results; recording what was done (all tasks listed).

Cross Reference Footnotes: See The Following Curriculum Objectives:
Same scale value appears in: 64 65 68 69.
Higher scale value appears in: 70.

Type of Objective Skill Factor IV No. 78
Skill or Knowledge Category Decision Making on Methods Scale Value 3.0
Occupation Patient Care Technician Level 2
Refers to Task Code No(s).: 18 33 65 133 156 (182) 185 243 299 308

Is there Cross Reference? ...Yes(X) ...No( ) If yes, see footnote(s).

Content: A graduate of the program at this educational level must be able to carry out the responsibility of exercising a choice over how to carry out the following task activities by choosing the appropriate option regarding what to do, what to use, or how to do the activities as appropriate to the instances of the tasks as they present themselves, and within the guidelines provided for making the choice. The tasks or activities in which this skill must be exercised are as follows:

1. Deciding whether to have staff member prepare labels or materials for blood sample or deciding to prepare personally (Task 18).

2. Deciding whether to delegate all or part of task of removing patient's sutures (Task 33).

3. Selecting steps appropriate to decontamination technique in preparing bronchial secretion specimen for laboratory (Task 65).

4. Deciding whether to have staff member prepare medication to be used in intramuscular or subcutaneous injection; deciding whether, if the type of medication or dosage seems in error, inappropriate, was already given, or is contraindicated by allergy, to refuse to inject and report to physician (Tasks 133, 299).

5. Deciding whether to have staff member bring materials and medications for irrigation and/or dressing of wound or opening for catheter, for administration of oxygen (Tasks 156, 185).

6. Deciding whether to drape patient who will have suction machine applied; deciding whether to cleanse area surrounding tracheal opening, how to handle clean-up after procedure (Task 182).

7. Selecting the proper restraints to use for patient (Task 243).

8. Deciding whether to prepare patient for ECG monitoring personally or have another staff member do this; deciding whether to reposition electrodes based on ECG display (Task 308).

Type of Objective Skill Factor IV No. 78
Skill or Knowledge Cagegory Decision Making on Methods Scale Value 3.0

Content Continued

To accomplish appropriate decision making on methods the student must be able to indicate the variety of situations likely to occur which would require making the choices, must be able to specify the choices available, and must be able to state what appropriate guidelines there are in order to accomplish the tasks successfully. The student should be able to list the choices, their indications for use and their contraindications, and must be able to provide justifications for the choices.

Cross Reference Footnotes: See The Following Curriculum Objectives:
Lower scale value appears in: 71 72 73 74 75 76.
Same scale value appears in: 77 79 80 81 82.
Higher scale value appears in: 83 84 85 86.

CURRICULUM OBJECTIVE SHEET

Type of Objective Skill Factor VI No. 80
Skill or Knowledge Category Decision Making on Methods Scale Value 3.0
Occupation Quality Assurance Technician Level 2
Refers to Task Code No(s).: 78 173 175 178 187 524 527 533 536 538 553 554

Is there Cross Reference? ...Yes(X) ...No( ) If yes, see footnote(s).

Content: A graduate of the program at this educational level must be able to carry out the responsibility of exercising a choice over how to carry out the following task activities by choosing the appropriate option regarding what to do, what to use, or how to do the activities as appropriate to the instances of the tasks as they present themselves, and within the guidelines provided for making the choice. The tasks or activities in which this skill must be exercised are as follows:

1. Selecting sources to refer to in order to complete missing information on radiographs or other diagnostic materials (Task 78).

2. Selecting further checks of x-ray machine timers after spinning top test depending on the pattern of light and dark dots (Task 173).

3. Selecting means of informing staff of compensations needed in technical factor settings (changes on technique chart for unit, posting notice, telling staff personally)(Task 175).

4. Deciding whether to do spinning top test after noting timer problem during check; deciding whether to shut down unit or report problem to staff after checking and preparing fluoroscope unit for use (Task 178).

5. Deciding whether to have cassette checked for proper assembly after checking film-screen contact (Task 187).

6. Selecting steps for preventive maintenance of computerized transverse axial tomography unit based on type of equipment, what is regularly done,or request to investigate (Task 524).

7. Selecting steps to correct or check problem while retrieving, displaying, and/or copying computerized transverse axial scans based on type of equipment; selecting settings and controls appropriate to unit (Task 527).

8. Deciding whether to check that standard x-ray film processing conditions are in use in connection with check of automatic exposure termination of diagnostic x-ray equipment (Task 533).

9. Deciding on hand tools, sequence of checks in providing visual and/or manual inspection of diagnostic radiography system; deciding whether to readjust draping of cables (Task 536).

Type of Objective Skill Factor VI No. 80
Skill or Knowledge Cagegory Decision Making on Methods Scale Value 3.0

Content Continued

10. Deciding whether to repeat HVL test at another kVp setting if equipment appears not to be within acceptable range in connection with check of filtration of diagnostic x-ray equipment (Task 538).

11. Deciding whether to have ion chamber or automatic charting equipment calibrated before use in reading film or TLD dosimeters; deciding number of dosimeters to use for calibration; deciding whether to have film dosimeters processed by staff member or do personally (Task 553).

12. Deciding how to prepare letter, reports and/or arrange interviews and follow-up in cases of unusually high personnel dosage levels (Task 554).

To accomplish appropriate decision making on methods the student must be able to indicate the variety of situations likely to occur which would require making the choices, must be able to specify the choices available, and must be able to state what appropriate guidelines there are in order to accomplish the tasks successfully. The student should be able to list the choices, their indications for use and their contraindications, and must be able to provide justifications for the choices.

Cross Reference Footnotes: See The Following Curriculum Objectives:
Lower scale value appears in: 71 72 73 74 75 76.
Same scale value appears in: 77 78 79 81 82.
Higher scale value appears in: 83 84 85 86.

CURRICULUM OBJECTIVE SHEET

Type of Objective Skill Factor IV No. 83
Skill or Knowledge Category Decision Making on Methods Scale Value 4.5
Occupation Patient Care Aide Level 1
Refers to Task Code No(s).: 73 113 (138) 290

Is there Cross Reference? ...Yes(X) ...No( ) If yes, see footnote(s).

Content: A graduate of the program at this educational level must be able to carry out the responsibility of exercising a choice over how to carry out the following task activities by choosing the appropriate option regarding what to do, what to use, or how to do the activities as appropriate to the instances of the tasks as they present themselves, and within the guidelines provided for making the choice. The tasks or activities in which this skill must be exercised are as follows:

1. Deciding how to reassure patient or accompanying adult about procedures, explain what will happen, answer questions (Tasks 73, 113, 290).

→ 2. Deciding what to bring to physician's attention regarding symptoms or concerns manifested by patient (Task 138).

To accomplish appropriate decision making on methods the student must be able to indicate the variety of situations likely to occur which would require making the choices, must be able to specify the choices available, and must be able to state what appropriate guidelines there are in order to accomplish the tasks successfully. The student should be able to list the choices, their indications for use and their contraindications, and must be able to provide justifications for the choices.

Cross Reference Footnotes: See The Following Curriculum Objectives:
Lower scale value appears in: 71 72 73 74 75 76 77 78 79 80 81 82.
Same scale value appears in: 84 85.
Higher scale value appears in: 86.

CURRICULUM OBJECTIVE SHEET

Type of Objective Skill Factor IV No. 87
Skill or Knowledge Category Decision Making on Quality Scale Value 1.5
Occupation Patient Care Aide Level 1
Refers to Task Code No(s).: (153)

Is there Cross Reference? ...Yes(X) ...No( ) If yes, see footnote(s).

Content: A graduate of the program at this educational level must be able to carry out the responsibility of exercising control over the quality of his or her task performance in the area of latitude provided between minimum standards and the highest possible quality that can be achieved. Activities in which this skill must be exercised are as follows:

→ 1. Taking care to attend to patient's comfort while assisting physician or co-worker in special examination or treatment procedure (Task 153).

To accomplish appropriate decision making on quality the student must be able to indicate the minimum standards for acceptable performance of the task or for the outputs of the task, must be able to indicate what latitude above the minimum standards is available to the performer to improve the quality, and must be able to indicate what priorities should be used to exercise judgment on when and where to exceed minimum standards of quality.

Cross Reference Footnotes: See The Following Curriculum Objectives:
Same scale value appears in: 88.
Higher scale value appears in: 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105.

CURRICULUM OBJECTIVE SHEET

Type of Objective Skill Factor IV No. 101
Skill or Knowledge Category Decision Making on Quality Scale Value 7.0
Occupation Patient Care Aide Level 1
Refers to Task Code No(s).: 73 74 113 138 190 287 289 295 301

Is there Cross Reference? ...Yes(X) ...No( ) If yes, see footnote(s).

Content: A graduate of the program at this educational level must be able to carry out the responsibility of exercising control over the quality of his or her task performance in the area of latitude provided between minimum standards and the highest possible quality that can be achieved. Activities in which this skill must be exercised are as follows:

1. In reassuring a patient or family member,or explaining about diagnostic radiography procedures,or explaining procedures to follow at home prior to coming for examination, making sure that the individual understands what is being said or is reassured (Tasks 73, 74, 113).

2. Being alert to notice any symptoms or asking about any concerns manifested by patient that should be brought to the attention of physician or staff, and being careful to report accurately (Task 138).

3. In assisting patient,being careful to handle patient properly and safely so as not to harm patient (Task 190).

4. In feeding patient, taking care to assist patient as appropriate to patient's condition and needs (Tasks 287, 289).

5. In participating in meeting of nursing personnel in x-ray department, taking responsibility for raising issues and problems; expressing opinions, and being actively involved in the progress of the meeting (Task 295).

6. In diapering a baby, being careful to clean and dry patient thoroughly (Task 301).

To accomplish appropriate decision making on quality the student must be able to indicate the minimum standards for acceptable performance of the tasks or for the outputs of the tasks, must be able to indicate what latitude above the minimum standards is available to the performer to improve the quality, and must be able to indicate what priorities should be used to exercise judgment on when and where to exceed minimum standards of quality.

Cross Reference Footnotes: See The Following Curriculum Objectives:
Lower scale value appears in: 87 88 89 90 91 92 93 94 95 96 97 98 99 100.
Same scale value appears: 102 103 104 105.

CURRICULUM OBJECTIVE SHEET

Type of Objective Skill Factor IV No. 102
Skill or Knowledge Category Decision Making on Quality Scale Value 7.0
Occupation Patient Care Technician Level 2
Refers to Task Code No(s).: 133 143 156 181 (182) 185 243 296 299

Is there Cross Reference? ...Yes(X) ...No( ) If yes, see footnote(s).

Content: A graduate of the program at this educational level must be able to carry out the responsibility of exercising control over the quality of his or her task performance in the area of latitude provided between minimum standards and the highest possible quality that can be achieved. Activities in which this skill must be exercised are as follows:

1. In administering a subcutaneous or intramuscular injection, taking care to explain name and purpose of medication and possible side effects, to check patient allergy, and to consider whether there are contraindications in regard to use or dosage; taking care to select appropriate site of injection (Tasks 133, 299).

2. In catheterizing a patient's urethra, taking care to reassure patient, follow sterile technique, cleanse patient, insert gently, and terminate if there is severe pain or if resistance is encountered to passage of catheter (Tasks 143, 181).

3. In irrigating or dressing a wound, burn, or opening for catheter, taking care to assess healing and conditions of wound before proceeding; using proper medications and materials (Task 156).

4. In setting up and using suction machine, taking care to reassure patient and explain; being careful in using suction; continuing until passage is cleared (Task 182).

5. In administering oxygen to patient, being careful to assess patient's response, determine when to administer and when to remove oxygen; reassuring patient (Task 185).

6. In restraining patient, being careful to reassure and calm patient in addition to using restraints (Task 243).

7. In providing first aid to patient, acting carefully, quickly, calmly, and accurately to assess condition, decide on and carry out care (Task 296).

To accomplish appropriate decision making on quality the student must be able to indicate the minimum standards for acceptable performance of the tasks or for the outputs of the tasks, must be able to indicate what latitude above the minimum standards is available to the performer to improve the quality, and must be able to indicate what priorities should be used to exercise judgment on when and where to exceed minimum standards of quality.

Cross Reference Footnotes: See The Following Curriculum Objectives:
Lower scale value appears in: 87 88 89 90 91 92 93 94 95 96 97 98 99 100.
Same scale value appears in: 101 103 104 105 and level 4 of patient care.

CURRICULUM OBJECTIVE SHEET

Type of Objective Skill Factor VI No. 103
Skill or Knowledge Category Decision Making on Quality Scale Value 7.0
Occupation Quality Assurance Technician Level 2
Refers to Task Code No(s).: 525 527 529 530 531 532 (533) 535 537 539 540 543 544 545 548 549 550 553 556

Is there Cross Reference? ...Yes(X) ...No( ) If yes, see footnote(s).

Content: A graduate of the program at this educational level must be able to carry out the responsibility of exercising control over the quality of his or her task performance in the area of latitude provided between minimum standards and the highest possible quality that can be achieved. Activities in which this skill must be exercised are as follows:

1. In checking calibration of computerized transverse axial tomography equipment, taking care to select appropriate test procedure, carry out check carefully, assess results, and make adjustments (Task 525).

2. In retrieving, displaying and copying computerized transverse axial scans, being careful to select appropriate display controls to provide diagnostic information; selecting and photographing sufficient displays using all appropriate display options (Task 527).

3. In testing x-ray equipment, or film, or film processors, or calibrating quality assurance test instruments, being careful to select appropriate test procedures for the equipment involved, carry out each test step carefully, record results accurately, assess results conscientiously, and discuss results with supervisor and/or radiologist in charge so as to assure that patient exposure is minimized, diagnostic reliability is provided, and legal requirements are met (Task 529, 530, 531, 532, 533, 535, 537, 539, 540, 543, 544, 548, 549, 556).

4. In monitoring patient exposure rates for routine diagnostic x-ray procedures, carrying out procedures carefully and accurately; recommending how to use gonadal shielding; helping to use results to make it possible to record cumulative patient exposure (Task 545).

5. In conducting radiation protection survey, carrying out procedures carefully and accurately; evaluating results conscientiously; using results to suggest the safest positions in room for personnel who must remain during exposure; suggesting corrective measures (Task 550).

6. In processing thermoluminescent or film personnel monitoring dosimeters, following procedures carefully, choosing appropriate steps; noting unusually high exposure readings and bringing to attention of appropriate supervisor (Task 553).

[page 2 of 2 omitted]

Type of Objective Skill Factor VI No. 108
Skill or Knowledge Category Figural Skills Scale Value 1.0
Occupation Quality Assurance Technician Level 2
Refers to Task Code No(s).: 78 175 524 527 529 530 531 532 533 534 535 536 538 539 540 544 548 549

Is there Cross Reference? ...Yes(X) ...No( ) If yes, see footnote(s).

Content: A graduate of the program at this educational level must be able to mentally manipulate (with or without physically manipulating) the figural aspects of objects in terms of size, shape, form, density, arrangement in space, in static array or in motion, to achieve the predetermined figural standards or objectives of size, shape, form, density, or arrangement in the following activities:

1. Viewing processed radiographs or photographs and noting whether identification information is missing; adding missing information on appropriate part of radiograph or photograph (Task 78).

2. Evaluating and/or comparing densities on test films using test tools or penetrometers (Tasks 175, 540, 544).

3. Using forming template, marking out its shape on skirt of new headbag for computerized transverse axial scanner; placing headbag in approximate position to fit over fixing studs (Task 524).

4. Adjusting visual display on computerized transverse axial equipment to achieve diagnostic quality images by using controls for the white-gray-black scale or for color as available (Task 527).

5. Centering center of cassette, phantom, radiation detection device, beam attenuator, or other test object to x-ray beam by using light field indicator and cross-hair shadows for center of field; with cassettes, placing so that cassette and light field image sides are parallel (Tasks 529, 530, 531, 532, 533, 534, 538, 539, 540, 544, 548).

6. Determining the corners of an image recorded on film by locating points, drawing straight lines connecting points so that they intersect at right angles or define diagonals (Tasks 529, 530).

7. Adjusting oscilloscope display to obtain clear kVp waveform image with base line at bottom of scale and trace peak at top, with a complete waveform on horizontal scale; copying waveform display on graph paper (Task 535).

8. Using angle measures, protractor, T-square, and/or level to check accuracy of tube angle indicators and position scales of x-ray machine (Task 536).

9. Using carpenter's square to make manual check of grid alignment of film changer; in using test tool to check grid alignment, evaluating whether location of pin appears along centerline of grid (Task 539).

Type of Objective Skill Factor VI No. 108
Skill or Knowledge Cagegory Figural Skills Scale Value 1.0

Content Continued

10. Plotting film densities and examining characteristic curve (Task 544).

11. Noting location of light points during test of leakage radiation; planning exposure reading at every point; planning a series of exposures within a given plane; placing radiation detector in predetermined positions (Task 549).

To accomplish this, the student must be able to state what figural standards must be achieved for each activity, and must be able to exercise the degree of figural mental precision necessary to achieve the standards.

Cross Reference Footnotes: See The Following Curriculum Objectives:
Same scale value appears in: 106 107 109.
Higher scale value appears in: 110 111 112.

CURRICULUM OBJECTIVE SHEET

Type of Objective Skill Factor III No. 115

Skill or Knowledge Category Symbolic Skills Scale Value 1.5

Occupation Radiologic Technologist Level 3

Refers to Task Code No(s).: 335 356 357 358 359 360 361 362 363 364 365 366 367 368 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 463 464 465 466 467 468 491 492 493 494 495 496 497 498 (*continued below)

Is there Cross Reference? ...Yes(X) ...No( ) If yes, see footnote(s).

Content: A graduate of the program at this educational level must be able to mentally manipulate and/or use symbols which are part of an abstract, non-representational system of notation where the symbols stand for properties, relationships, or operations in the following activities:

1. Using formula for magnification to solve equations for unknown portions (distances); using arithmetic manipulations and numerical and algebraic symbols (tasks where appropriate).

2. Using conversion charts or posted information to reconvert technical exposure factors to an equivalent output using arithmetic manipulations and numerical symbols (tasks where appropriate).

3. Calculating distances in order to localize lesion using arithmetic manipulations and numerical symbols (Task 374).

To accomplish this, the student must be able to indicate what each symbol represents, must be able to manipulate each as required, and be sufficiently accurate to meet the standards for the activities.

Cross Reference Footnotes: See The Following Curriculum Objectives:

Same scale value appears in: 113 114.

Higher scale value appears in level 5.

* 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519.

Type of Objective Skill Factor III No. 118
Skill or Knowledge Category Taxonomic Skills Scale Value 2.0
Occupation Radiologic Technologist Level 3
Refers to Task Code No(s).: 81 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 463 464 465 466 467 468 491 492 493 494 495 496 (*continued below)
Is there Cross Reference? ...Yes(X) ...No( ) If yes, see footnote(s).

Content: A graduate of the program at this educational level must be able to consciously apply conceptual classifying or organizing principles to suit the needs of the following activities:

1. In considering the quality of radiographs, noting appearances that seem medically suspicious, signs of pathological conditions (Task 81).

2. Considering what technologist should do to improve quality of radiographs, such as adjustment of technical factors, repositioning of patient, or making additional exposures (Task 81).

3. Determining from requisition sheet, patient's medical-technical chart, and/or staff the examination called for, the patient involved, special considerations, patient's condition; checking for possible contraindications; noting information that may affect how patient is to be handled or technical factors; noting or selecting equipment to be used; checking on completeness of information; determining what prior preparation was ordered; selecting appropriate steps (all tasks listed except Task 81).

4. Evaluating orders for patient positions and projections of the area of interest in relation to patient's condition; considering the need for a change from standard positions to accomplish the purpose of the examination and offer the least discomfort to patient (all tasks listed).

5. Considering patient's body type, size, sex, age or muscularity in determining correct technical factors and positioning (tasks listed as appropriate).

6. Observing patient throughout procedure and being alert for any signs of pain, emergency, adverse reaction to procedure or contrast medium, or impairment of respiration; noting any signs of malfunction of equipment (all tasks listed except Task 81).

To accomplish this, the student must be able to indicate what existing principles of classification or organization are appropriate to the situations of the tasks, and must indicate how they must be applied to suit the needs of the situations acceptably.

Cross Reference Footnotes: See The Following Curriculum Objectives;
Same scale value appears in: 116 117.
Higher scale value appears in level 5.

* 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 526.

CURRICULUM OBJECTIVE SHEET

Type of Objective Skill Factor IV No. 120
Skill or Knowledge Category Implicative Skills Scale Value 1.0
Occupation Patient Care Technician Level 2
Refers to Task Code No(s).: 33 65 133 143 156 181 (182) 185 299 308

Is there Cross Reference? ...Yes(X) ...No( ) If yes, see footnote(s).

Content: A graduate of the program at this educational level must be able to come to conclusions, draw implications, or foresee consequences based on information in order to carry out the following activities:

1. Concluding whether patient's wound or suture shows signs of infection; deciding what to do (Tasks 33, 156).

2. Concluding the likely number of separate specimens that will be prepared during procedure to take extravascular body fluid specimens, washings, cell and/or tissue bipsies (Task 65).

3. Concluding whether medication type or dosage ordered is inappropriate, has already been administered, may be in error or contraindicated for patient; deciding whether to refuse to inject (Tasks 133, 299).

4. Concluding whether patient's pain or difficulty in passing a urethral catheter warrants termination of procedure and reporting to physician in charge (Tasks 143, 181).

5. Concluding whether tracheostomy passage has been sufficiently cleared by suctioning and whether surrounding area needs cleansing (Task 182).

6. Concluding when patient needs to have oxygen administered and whether patient is responding (Task 185).

7. Concluding whether ECG being monitored shows emergency signs or unusual reading; deciding whether to report this (Task 308).

To accomplish this, the student must be able to indicate the types of information from which he or she must draw in the various instances of the activity which may arise, and must be able to indicate what inferences, consequences, or conclusions are implied by various possible combinations of information as appropriate for the situations. The student should be able to defend the implications drawn using appropriate criteria.

Cross Reference Footnotes: See The Following Curriculum Objectives:
Same scale value appears in: 119 121 122 123.
Higher scale value appears in: 124 125 126 127 128.

Type of Objective Skill Factor VI No. 122
Skill or Knowledge Category Implicative Skills Scale Value 1.0
Occupation Quality Assurance Technician Level 2
Refers to Task Code No(s).: 173 175 178 523 527 529 530 531 532 533 535 537 538 539 540 543 544 545 548 549 556

Is there Cross Reference? ...Yes(X) ...No( ) If yes, see footnote(s).

Content: A graduate of the program at this educational level must be able to come to conclusions, draw implications, or foresee consequences based on information in order to carry out the following activities:

1. Concluding whether problems encountered with x-ray machines are independent of timer accuracy after doing spinning top test; concluding nature of timer problems from results (Task 173).

2. Concluding whether there are problems with calibration of kVp or mA selectors after doing penetrometer test; concluding nature of problem, whether repair is needed (Task 175).

3. Concluding whether there are problems with fluoroscopic controls after checking equipment; concluding nature of problem,whether repair is needed (Task 178).

4. Concluding whether there are problems with computerized transverse axial tomography equipment after preparing for use; concluding nature of problem,whether repair or testing is needed (Task 523).

5. Concluding when computerized transverse axial scan display is adjusted for optimum sharpness and density gradation for the tissues in the area of interest and the possible pathological condition involved (Task 527).

6. Concluding whether diagnostic x-ray equipment meets acceptable standards for field limitation, receptor and light field alignment, minimum TOD, TFD, and field size indicators after making radiographic tests; concluding effects of any problems and deviations from acceptable standards in terms of patient exposure, diagnostic reliability, legal requirements (Task 530).

7. Concluding whether diagnostic x-ray equipment meets acceptable standards for fluoroscopic and spot film field limitation, field and image receptor alignment, maximum TID, minimum TOD and other requirements after inspecting, making radiographic tests; concluding effects of any problems and deviations from acceptable standards (Task 530).

8. Concluding whether diagnostic x-ray tube overload protection and effective focal spot size meet acceptable standards after making tests; concluding effects of any problems and deviations from acceptable standards (Task 531).

Type of Objective Skill Factor VI No. 122
Skill or Knowledge Cagegory Implicative Skills Scale Value 1.0

Content Continued

9. Concluding whether diagnostic x-ray equipment exposure timers and/or automatic exposure termination devices meet acceptable standards after making direct calibration tests: concluding effects of any problems and deviations from acceptable standards (Tasks 532, 533).

10. Concluding whether kVp, mA, mAs, exposure rates or reproducibility of diagnostic x-ray equipment output meet acceptable standards after making direct calibration tests or making calibrated penetrometer and/or densitometer tests of calibration; concluding effects of any problems and deviations from acceptable standards (Task 535).

11. Concluding whether tomography equipment functions mechanically and whether fulcrum position, resolution, exposure uniformity and/or grid alignment meet acceptable standards after making mechanical and radiographic tests; concluding effects of any problems and deviations from acceptable standards (Task 537).

12. Concluding whether inherent filtration of diagnostic x-ray equipment meets acceptable standards after making radiographic tests; concluding effects of any problems and deviations from acceptable standards (Task 538).

13. Concluding whether bucky grid alignment and/or centering of diagnostic x-ray equipment meets acceptable standards after making mechanical or radiographic tests; concluding effects of any problems and deviations from acceptable standards (Task 539).

14. Concluding whether automatic brightness control and/or the focus, resolution, and distortion of fluoroscopic optical system meet acceptable standards after making radiographic tests; concluding effects of any problems and deviations from acceptable standards (Task 540).

15. Concluding whether automatic x-ray film processors show malfunction of processing components, errors in temperature, or need to replenish processing chemicals after making radiographic and sensitometer, densitometer tests; concluding whether variations are within acceptable range or the corrective steps to take (Task 543).

16. Concluding the appropriate uses for x-ray film and/or dosimetric film batches after determining exposure characteristics (Task 544).

17. Concluding whether diagnostic x-ray examinations being conducted meet acceptable patient exposure standards after monitoring patient exposure rates; concluding the gonadal shielding appropriate for specific examinations and positions, concluding whether equipment problems exist; concluding effects of problems and deviations from acceptable standards (Task 545).

Type of Objective Skill Factor VI No. 122
Skill or Knowledge Cagegory Implicative Skills Scale Value 1.0

Content Continued

18. Determining whether diagnostic x-ray equipment meets acceptable limits for entrance exposure rate, barrier transmitted rate, leakage radiation rate from source assembly after making tests; concluding effect of problems and deviations from acceptable standards (Tasks 548, 549).

19. Concluding whether there are problems with calibration of diagnostic test, survey, or electrical measuring instruments, densitometer, or sensitometer after carrying out tests; concluding what to do with equipment (Task 556).

To accomplish this, the student must be able to indicate the types of information from which he or she must draw in the various instances of the activity which may arise, and must be able to indicate what inferences, consequences, or conclusions are implied by various possible combinations of information as appropriate for the situations. The student should be able to defend the implications drawn using appropriate criteria.

Cross Reference Footnotes: See The Following Curriculum Objectives:
Same scale value appears in: 119 120 121 123.
Higher scale value appears in: 124 125 126 127 128.

Type of Objective Skill Factor VI No. 126
Skill or Knowledge Category Implicative Skills Scale Value 2.0
Occupation Quality Assurance Technician Level 2
Refers to Task Code No(s).: 78 276 280 524 525 550

Is there Cross Reference? ...Yes(X) ...No( ) If yes, see footnote(s).

Content: A graduate of the program at this educational level must be able to come to conclusions, draw implications, or foresee consequences based on information in order to carry out the following activities:

1. In checking and jacketing radiographic materials and finding missing information, concluding what a radiograph represents, the view, the patient,or the technologist who made it,based on information sources and other materials available (Task 78).

2. Concluding the probable source of reported problems with automatic x-ray film processing machine, the method of investigation, and what to do (Task 276).

3. Concluding whether performer has been accidentally exposed to excessive radiation, and/or drawing implications about past exposure to try to explain source of recorded high personal exposure to radiation (Task 280).

4. Concluding the possible source of problems with computerized transverse axial tomography equipment and the method of investigation or repair (Tasks 524, 525).

5. Concluding whether stray radiation and transmission across primary and secondary protective barriers in a diagnostic x-ray installation survey is within acceptable limits for personnel maximum permissible dose equivalents after making appropriate tests and considering appropriate factors; drawing implications for deployment of staff, on sources of problems, on corrective measures, effect of problems and deviations from acceptable standards (Task 550).

To accomplish this, the student must be able to indicate the types of information from which he or she must draw in the various instances of the activity which may arise, and must be able to indicate what inferences, consequences, or conclusions are implied by various possible combinations of information as appropriate for the situations. The student should be able to defend the implications drawn using appropriate criteria.

Cross Reference Footnotes: See The Following Curriculum Objectives:
Lower scale value appears in: 119 120 121 122 123.
Same scale value appears in: 124 125 127.
Higher scale value appears in: 128 and level 5.

Type of Objective Skill Factor IV No. 129
Skill or Knowledge Category Financial Consequences of Error Scale Value 1.0
Occupation Patient Care Aide Level 1
Refers to Task Code No(s).: 73 74 98 113 138 153 155 166 199 262 271 278 282 283 287 289 290 291 303

Is there Cross Reference? ...Yes(X) ...No( ) If yes, see footnote(s).

Content: A graduate of the program at this educational level must be able to display an appropriate awareness of the financial consequences which can result from errors, even after proper training, in the performance of the following tasks:

1. Reassuring any patient and/or accompanying adult about x-ray and/or fluoroscopy procedures (Task 73).

2. Explaining to any out-patient or accompanying adult proper at-home procedures to follow prior to coming for radiographic or fluoroscopic examination (Task 74).

3. Obtaining a clean catch urine specimen from any patient and preparing for laboratory (Task 98).

4. Giving any patient general reassurance (Task 113).

5. Reporting observed symptoms and concerns of any patient to physician or staff member (Task 138).

6. Assisting physician or co-worker in special examination or treatment procedures (Task 153).

7. Obtaining urine specimen on orders (Task 155).

8. Using isolation and decontamination techniques to prepare examination or treatment room or area and clean up afterwards for patient with infectious or communicable condition (Task 166).

9. Taking and recording vital signs (temperature, pulse, respiration and blood pressure) of any patient (Task 199).

10. Taking an electrocardiogram of any patient as ordered or determined (Task 262).

11. Deciding whether to call staff person to evaluate whether unusual ECG reading is artifact, or calling physician in case of serious patient distress (Task 271).

12. Checking on reasons for nonappearance of in-patients for examinations or treatment (Task 278).

13. Escorting adult out-patients to and/or from dressing rooms, treatment rooms and/or waiting areas (Task 282).

Type of Objective Skill Factor IV No. 129
Skill or Knowledge Cagegory Financial Consequences of Error Scale Value 1.0

Content Continued

14. On orders, deciding whether wound of any patient needing change of dressing needs attention of RN; changing simple dry dressing or reinforcing wet dressing (Task 283).

15. On orders, placing order for specific dietetic meal; picking up, delivering, and feeding patient if so decided (Task 287).

16. Bottle feeding a baby with pre-prepared formula (Task 289).

17. Changing any patient's colostomy bag on orders (Task 290).

18. Taking and reporting temperature of any non-pediatric patient with oral thermometer on orders (Task 291).

19. Arranging, measuring, and recording food intake and excretory output as ordered (Task 303).

To accomplish this, the student must be able to indicate the financial value of the output, equipment, materials, or time involved in the tasks. The student should be able to indicate what the most obvious errors during learning would be, the most serious likely error after proper training has been accomplished, what the financial consequences would be, should be able to state what should be done to avoid the errors, and should be able to carry this out.

Cross Reference Footnotes: See The Following Curriculum Objectives:
Same scale value appears in: 130 131 132 133 134.
Higher scale value appears in: 135 136 137.

Type of Objective Skill Factor VI No. 132
Skill or Knowledge Category Financial Consequences of Error Scale Value 1.0
Occupation Quality Assurance Technician Level 2
Refers to Task Code No(s).: 78 173 280 523 524 525 527 529 530 531 532 533 534 536 537 538 539 540 543 544 545 548 549 550 553 554 556

Is there Cross Reference? ...Yes(X) ...No( ) If yes, see footnote(s).

Content: A graduate of the program at this educational level must be able to display an appropriate awareness of the financial consequences which can result from errors, even after proper training, in the performance of the following tasks:

1. Checking and jacketing patient's radiographs, ultrasonograms, and/or C.T.T. scans with requisition sheets and prior diagnostic materials and placing for filing and interpreting (Task 78).

2. Checking accuracy of x-ray machine timers (except phototimers) with spinning top test (Task 173).

3. Participating in monitoring of personal exposure to radiation by periodically turning in and replacing film strip in badge worn by performer (Task 280).

4. Preparing computerized transverse axial tomography (C.T.T.) equipment for use (Task 523).

5. Providing preventive maintenance for display tube surface, camera, disc and/or tape drive units, and/or scanning assembly (especially water-using head box assembly) of computerized transverse axial tomography (C.T.T.) equipment (Task 524).

6. Checking calibration and accuracy of C.T.T. equipment by making test scans (Task 525).

7. Retrieving, displaying and making photographs, printouts and/or magnetic tape records of computerized transverse axial tomographic (C.T.T.) scans (Task 527).

8. Checking x-ray field limitation, x-ray receptor and light field alignment, minimum TOD, TFD and field size indicators for diagnostic x-ray equipment (Task 529).

9. Checking fluoroscopic and spot film x-ray field limitation, x-ray field and image receptor alignment, maximum TID, minimum TOD, and other requirements (Task 530).

10. Testing whether diagnostic x-ray tube overload protection and/or effective focal spot size meet acceptable standards (Task 531).

11. Checking and/or performing direct calibration tests of diagnostic radiography equipment exposure timers (Task 532).

Type of Objective Skill Factor VI No. 132
Skill or Knowledge Cagegory Financial Consequences of Error Scale Value 1.0

Content Continued

12. Checking automatic exposure termination of diagnostic radiography equipment (Task 533).

13. Providing visual and radiographic or fluoroscopic inspection of personnel shielding devices such as leaded gloves, aprons, sheets, gonadal shields (Task 534).

14. Providing visual and/or manual inspection of diagnostic radiography system (Task 536).

15. Checking diagnostic tomography x-ray equipment for mechanical operation, fulcrum position, resolution, exposure uniformity and/or grid alignment (Task 537).

16. Estimating HVL and checking adequacy of filtration of diagnostic x-ray equipment (Task 538).

17. Checking bucky grid alignment and/or centering in diagnostic radiography equipment (Task 539).

18. Checking fluoroscopic automatic brightness control system and/or focus, resolution and distortion of the optical system (Task 540).

19. Monitoring and evaluating x-ray film processors (Task 543).

20. Determining exposure characteristics of x-ray and/or dosimetric films (Task 544).

21. Monitoring patient exposure rates for routine diagnostic x-ray procedures (Task 545).

22. Checking maximum entrance exposure rate and primary barrier transmitted radiation rate for fluoroscopic equipment (Task 548).

23. Checking the leakage radiation rate from the source assembly of diagnostic x-ray equipment (Task 549).

24. Conducting protection survey of stray radiation within diagnostic x-ray installation and transmission across primary and secondary protective barriers (Task 550).

25. Reading and recording exposure from personnel monitoring film or thermoluminescent dosimeters (Task 553).

26. Entering, evaluating occupational radiation exposure data and initiating action on dangerous levels (Task 554).

Type of Objective Skill Factor VI No. 132
Skill or Knowledge Cagegory Financial Consequences of Error Scale Value 1.0

Content Continued

27. Calibrating diagnostic x-ray test, survey, or measuring instruments (Task 556).

To accomplish this, the student must be able to indicate the financial value of the output, equipment, materials, or time involved in the tasks. The student should be able to indicate what the most obvious errors during learning would be, the most serious likely error after proper training has been accomplished, what the financial consequences would be, should be able to state what should be done to avoid the errors, and should be able to carry this out.

Cross Reference Footnotes: See The Following Curriculum Objectives:
Same scale value appears in: 129 130 131 133 134.
Higher scale value appears in: 135 136 137.

Type of Objective Skill Factor IV No. 138
Skill or Knowledge Category Consequences of Error to Humans Scale Value 1.0
Occupation Patient Care Aide Level 1
Refers to Task Code No(s).: 73 (74) 98 113 155 199 262 278 279 281 287 290 291 302 303 520

Is there Cross Reference? ...Yes(X) ...No( ) If yes, see footnote(s).

Content: A graduate of the program at this educational level must be able to display an appropriate awareness of what harm can be done to self, patients, co-workers, or society as a whole, as a result of errors, even after proper training, in the performance of the following tasks:

1. Reassuring any patient and/or accompanying adult about x-ray and/or fluoroscopy procedures (Task 73).

2. Explaining to any out-patient or accompanying adult proper at-home procedures to follow prior to coming for radiographic or fluoroscopic examination (Task 74).

3. Obtaining a clean catch urine specimen from any patient and preparing for laboratory (Task 98).

4. Giving any patient general reassurance (Task 113).

5. Obtaining urine specimen on orders (Task 155).

6. Taking and recording vital signs (temperature, pulse, respiration, and blood pressure) of any patient (Task 199).

7. Taking electrocardiogram of any patient as ordered or determined (Task 262).

8. Checking on reasons for nonappearance of in-patients for examinations or treatment (Task 278).

9. Notifying ward or floor personnel to ready and transport in-patients who are scheduled for specific procedures at specific times (Task 279).

10. Checking in-patients' identity against patients' treatment and medication check lists; stamping arrival and departure times; attaching cards to patients indicating special conditions (Task 281).

11. On orders, placing order for specific dietetic meal; picking up, delivering, and feeding patient if so decided (Task 287).

12. Changing any patient's colostomy bag on orders (Task 290).

13. Taking and reporting temperature of any non-pediatric patient with oral thermometer on orders (Task 291).

14. Placing or making call and delivering non-medical message at patient or co-worker's request (Task 302).

Type of Objective Skill Factor IV No. 138
Skill or Knowledge Cagegory Consequences of Error to Humans Scale Value 1.0

Content Continued

15. Arranging, measuring, and recording food intake and excretory output as ordered (Task 303).

16. Preparing any patient and attaching electrodes for electrocardiogram monitoring (Task 520).

To accomplish this, the student must be able to indicate the harm that can be done to humans at every point in the steps of the task(s). The student should be able to indicate what the most obvious errors during learning would be, the most serious likely error after proper training has been accomplished, what the consequences of error to humans would be, should be able to state what should be done to avoid error(s), and should be able to carry this out.

Cross Reference Footnotes: See The Following Curriculum Objectives:
Same scale value appears in: 139 140 141 142 143.
Higher scale value appears in: 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161.

CURRICULUM OBJECTIVE SHEET

Type of Objective Skill Factor IV No. 145

Skill or Knowledge Category Consequences of Error to Humans Scale Value 2.0

Occupation Patient Care Technician Level 2

Refers to Task Code No(s).: 18 156 (182)

Is there Cross Reference? ...Yes(X) ...No( ) If yes, see footnote(s).

Content: A graduate of the program at this educational level must be able to display an appropriate awareness of what harm can be done to self, patients, co-workers, or society as a whole, as a result of errors, even after proper training, in the performance of the following tasks:

1. Drawing blood from any non-pediatric patient's vein on orders (Task 18).

2. Irrigating, cleaning, dressing or redressing any patient's wound, burn, or opening for catheter as ordered (Task 156).

3. Setting up and using suction machine to clear airway or to assist with gastric lavage (Task 182).

To accomplish this, the student must be able to indicate the harm that can be done to humans at every point in the steps of the task(s). The student should be able to indicate what the most obvious errors during learning would be, the most serious likely error after proper training has been accomplished, what the consequences for humans would be, should be able to state what should be done to avoid error(s), and should be able to carry this out.

Cross Reference Footnotes: See The Following Curriculum Objectives:
Lower scale value appears in: 138 139 140 141 142 143.
Same scale value appears in: 144 146 147.
Higher scale value appears in: 148 149 150 151 152 153 154 155 156 157 158 159 160 161.

CURRICULUM OBJECTIVE SHEET

Type of Objective Skill Factor IV No. 148
Skill or Knowledge Category Consequences of Error to Humans Scale Value 3.0
Occupation Patient Care Aide Level 1
Refers to Task Code No(s).: 138 153 166 295

Is there Cross Reference? ...Yes(X) ...No( ) If yes, see footnote(s).

Content: A graduate of the program at this educational level must be able to display an appropriate awareness of what harm can be done to self, patients, co-workers, or society as a whole, as a result of errors, even after proper training, in the performance of the following tasks:

1. Reporting observed symptoms and concerns of any patient to physician or staff member (Task 138).

2. Assisting physician or co-worker in special examination or treatment procedures (Task 153).

3. Using isolation and decontamination techniques to prepare examination or treatment room or area and clean up afterwards for patient with infectious or communicable condition (Task 166).

4. Participating in meeting of nursing personnel in x-ray department (Task 295).

To accomplish this, the student must be able to indicate the harm that can be done to humans at every point in the steps of the task(s). The student should be able to indicate what the most obvious errors during learning would be, should be able to state what should be done to avoid error(s), and should be able to carry this out.

Cross Reference Footnotes: See The Following Curriculum Objectives:
Lower scale value appears in: 138 139 140 141 142 143 144 145 146 147.
Same scale value appears in: 149 150 151 152.
Higher scale value appears in: 153 154 155 156 157 158 159 160 161.

Type of Objective Skill Factor VI No. 156
Skill or Knowledge Category Consequences of Error to Humans Scale Value 5.5
Occupation Quality Assurance Technician Level 2
Refers to Task Code No.(s).: 178 280 523 524 525 531 532 533 536 537 538 539 544 553 554 556

Is there Cross Reference? ...Yes(X) ...No( ) If yes, see footnote(s).

Content: A graduate of the program at this educational level must be able to display an appropriate awareness of what harm can be done to self, patients, co-workers, or society as a whole, as a result of errors, even after proper training, in the performance of the following tasks:

1. Checking, preparing fluoroscope controls (and phototimer) (Task 178).

2. Participating in monitoring of personal exposure to radiation by periodically turning in and replacing film strip in badge worn by performer (Task 280).

3. Preparing computerized transverse axial tomography (C.T.T.) equipment for use (Task 523).

4. Providing preventive maintenance for display tube surface, camera, disc and/or tape drive units, and/or scanning assembly (especially water-using head box assembly) of computerized transverse axial tomography (C.T.T.) equipment (Task 524).

5. Checking calibration and accuracy of C.T.T. equipment by making test scans (Task 525).

6. Testing whether diagnostic x-ray tube overload protection and/or effective focal spot size meet acceptable standards (Task 531).

7. Checking and/or performing direct calibration tests of diagnostic radiography equipment exposure timers (Task 532).

8. Checking automatic exposure termination of diagnostic radiography equipment (Task 533).

9. Providing visual and/or manual inspection of diagnostic radiography system (Task 536).

10. Checking diagnostic tomography x-ray equipment for mechanical operation, fulcrum position, resolution, exposure uniformity, and/or grid alignment (Task 537).

11. Estimating HVL and checking adequacy of filtration of diagnostic x-ray equipment (Task 538).

12. Checking bucky grid alignment and/or centering in diagnostic radiography equipment (Task 539).

Type of Objective Skill Factor VI No. 156
Skill or Knowledge Category Consequences of Error to Humans Scale Value 5.5

Content Continued

13. Determining exposure characteristics of x-ray and/or dosimetric films (Task 544).

14. Reading and recording exposure from personnel monitoring film or thermoluminescent dosimeters (Task 553).

15. Entering, evaluating occupational radiation exposure data and initiating action on dangerous levels (Task 554).

16. Calibrating diagnostic x-ray test, survey, or measuring instruments (Task 556).

To accomplish this, the student must be able to indicate the harm that can be done to humans at every point in the steps of the task(s). The student should be able to indicate what the most obvious errors during learning would be, the most serious likely error after proper training has been accomplished, what the consequences for humans would be, should be able to state what should be done to avoid errors, and should be able to carry this out.

Cross Reference Footnotes: See The Following Curriculum Objectives:
Lower scale value appears in: 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152.
Same scale value appears in: 153 154 155 157.
Higher scale value appears in: 158 159 160 161.

Type of Objective Knowledge Factor III No. 162
Skill or Knowledge Category 11731000 Scale Value 2.5
Occupation Radiologic Technologist Level 3
Refers to Task Code No(s).: 353 362 363 368 371 376 378 381 382 383 384 385 386 387 388 389 390 463 465 496 500 501 502 503 511 512 513 515 518 519

Is there Cross Reference? ...Yes(X) ...No( ) If yes, see footnote(s).

Content: A graduate of the program at this educational level must be able to demonstrate mastery of the following subject area

Normal Structure and Function (human anatomy and physiology; an overview of the nature of normal structure, function, and/or interrelationships of systems and processes)

at a level of awareness and depth of understanding adequate to the proper performance of the following activities:

1. In participating in meeting of diagnostic x-ray department technologists, being able to comprehend, raise issues, or participate in any discussion requiring an overview of normal human anatomy and physiology as it relates to radiographic examinations, use of equipment,or patient care (Task 353).

2. Applying information about normal structure and function to take account of patient's size, sex, body type, muscularity or other tissue characteristics in relation to centering, positioning of patient, selection of film size, and selection of technical factors for radiographic examination requested (all tasks listed except 353).

To accomplish these activities the student must have a detailed knowledge of the subject category, covering the appropriate technical or special terms, facts, equipment, and/or procedures which are part of this discipline and are required for successful completion of the activities listed above.

Cross Reference Footnote:
Higher scale value appears in level 4.

CURRICULUM OBJECTIVE SHEET

Type of Objective Knowledge Factor III No. 165
Skill or Knowledge Category 11731100 Scale Value 3.5
Occupation Radiologic Technologist Level 3
Refers to Task Code No(s).: 355 356 357 358 359 360 361 362 363 364 365 366 367 368 370 371 373 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 463 465 466 467 468 491 492 493 494 495 496 497 498 499 500 (*continued below)
Is there Cross Reference? ...Yes(X) ...No( ) If yes, see footnote(s).

Content: A graduate of the program at this educational level must be able to demonstrate mastery of the following subject area

> Regional Anatomy (includes head and neck, thorax and abdomen, pelvis and perineum, lower and upper limbs, and skeleton; internal structure and connections between major parts, systems, and sections of the body).

at a level of awareness and depth of understanding adequate to the proper performance of the following activities:

1. After reading requisition sheet indicating area of interest, being able to select appropriate film size, patient positions and centering to demonstrate the part of the body involved; being able to consider internal structures in relation to patient positions, taking account of patient's age, sex, size and body type as appropriate for the area of interest (all tasks listed).

2. Considering appropriate shielding for radiosensitive tissue by considering the direction of the central ray and the proximity of tissues in the area of interest to radiosensitive tissues (all tasks listed).

3. Positioning patient in relation to film and x-ray beam to obtain views requested; selecting technical factors appropriate to the area of interest and tissue type involved (all tasks listed).

To accomplish these activities the student must have a detailed knowledge of the subject category, covering the appropriate technical or special terms, facts, equipment, and/or procedures which are part of this discipline and are required for successful completion of the activities listed above.

Cross Reference Footnotes: See The Following Curriculum Objectives:
Lower scale value appears in: 163
Same scale value appears in: 164.
Higher scale value appears in: 166 167 168.

* 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519.

Type of Objective Knowledge Factor III No. 174
Skill or Knowledge Category 11731200 Scale Value 3.5
Occupation Radiologic Technologist Level 3
Refers to Task Code No(s).: 355 356 357 358 359 360 361 362 363 364 365 366 367 368 370 371 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 463 465 466 467 468 491 492 493 494 495 496 497 498 499 500 (*continued below)
Is there Cross Reference? ...Yes(X) ...No( ) If yes, see footnote(s).

Content: A graduate of the program at this educational level must be able to demonstrate mastery of the following subject area

Topographic Anatomy (relation of external physical manifestations to internal structure and function of parts of the body)

at a level of awareness and depth of understanding adequate to the proper performance of the following activities:

1. In positioning patient, being able to select the appropriate external anatomical reference points to position patient for the specific examination according to the area of the body involved, or to select alternative points if patient is obese and traditional points are obscured by fat; being able to account for bodily habitus in relating external references to internal structures; being able to refer to, draw,or imagine anatomical reference lines to provide appropriate angulation and rotation; being able to locate position of gonads to provide appropriate shielding based on position of patient (all tasks as appropriate).

2. In positioning patient, being able to take account of location of suspected fractures, unhealed fractures,or presence of foreign bodies and handle patient accordingly (all tasks as appropriate).

To accomplish these activities the student must have a detailed knowledge of the subject category, covering the appropriate technical or special terms, facts, equipment, and/or procedures which are part of this discipline and are required for successful completion of the activities listed above.

Cross Reference Footnotes: See The Following Curriculum Objectives:
Lower scale value appears in: 169 170 171 172.
Same scale value appears in: 173.
Higher scale value appears in: 175 176.

* 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519.

CURRICULUM OBJECTIVE SHEET

Type of Objective Knowledge Factor IV No. 225
Skill or Knowledge Category 11735400 Scale Value 1.5
Occupation Patient Care Technician Level 2
Refers to Task Code No(s).: 18 65 182

Is there Cross Reference? ...Yes(X) ...No( ) If yes, see footnote(s).

Content: A graduate of the program at this educational level must be able to demonstrate mastery of the following subject area

Introductory Procedures (includes injections, transfusion, irrigation, catheterization, intubation, tracheotomy)

at a level of awareness and depth of understanding adequate to the proper performance of the following activities:

1. In drawing blood from a patient's vein, being able to apply information on introductory procedures in order to properly use materials, select site, make puncture, check needle position, and draw proper amount of blood (Task 18).

2. Being able to use details about introductory procedures for obtaining specimens such as extravascular body fluids, washings, or biopsies to be ready to receive specimens and prepare them in cooperation with the physician carrying out the procedures (Task 65).

3. In setting up and using suction machine, being able to apply details about catheterization and tracheotomy to properly insert suction catheter into tracheostomy and clear passage (Task 182).

To accomplish these activities the student must have a detailed knowledge of the subject category, covering the appropriate technical or special terms, facts, equipment, and/or procedures which are part of this discipline and are required for successful completion of the activities listed above.

Cross Reference Footnotes: See The Following Curriculum Objectives:
Same scale value appears in: 226 227.
Higher scale value appears in: 228 229 230.

Type of Objective Knowledge Factor IV No. 246
Skill or Knowledge Category 11737300 Scale Value 1.5
Occupation Patient Care Aide Level 1
Refers to Task Code No(s).: (153) 155 295

Is there Cross Reference? ...Yes(X) ...No( ) If yes, see footnote(s).

Content: A graduate of the program at this educational level must be able to demonstrate mastery of the following subject area

Handling and Transportation of the Sick or Wounded

at a level of awareness and depth of understanding adequate to the proper performance of the following activities:

1. In assisting with restraining or immobilizing patient or in assisting patient in bathroom, being able to apply information on handling of sick patient as appropriate to the patient's condition (Tasks 153, 155).

2. In participating in meeting of diagnostic x-ray department nursing staff, being able to comprehend, raise issues, or participate in any discussion dealing with the handling and transportation of sick or wounded patients (Task 295).

To accomplish these activities the student must have a detailed knowledge of the subject category, covering the appropriate technical or special terms, facts, equipment, and/or procedures which are part of this discipline and are required for successful completion of the activities listed above.

Cross Reference Footnotes: See The Following Curriculum Objectives:
Higher scale value appears in: 247 248 249 250 251 252 253 254.

Type of Objective Knowledge Factor III No. 254
Skill or Knowledge Category 11737300 Scale Value 5.5
Occupation Radiologic Technologist Level 3
Refers to Task Code No(s).: 353 355 356 357 358 359 360 361 362 363 364 365 366 367 368 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 463 465 466 467 468 491 492 493 494 495 496 497 498 499 500 (*continued below)
Is there Cross Reference? ...Yes(X) ...No( ) If yes, see footnote(s).

Content: A graduate of the program at this educational level must be able to demonstrate mastery of the following subject area

Handling and Transportation of the Sick or Wounded

at a level of awareness and depth of understanding adequate to the proper performance of the following activities:

1. In participating in meeting of diagnostic x-ray department technologists, being able to comprehend, raise issues, or participate in any discussion dealing with the handling and transportation of sick or wounded patients during radiographic examinations (Task 353).

2. In taking radiographs, being able to use details about the proper way to handle and transport sick or wounded patients so as to properly assist or transfer patient to or from wheelchair, stretcher, examination table, lavatory, determine when to request assistance in moving patient, and to position and immobilize patient so as to avoid injury or unnecessary pain, based on the patient's age and condition (all tasks listed except Task 353).

To accomplish these activities the student must have a detailed knowledge of the subject category, covering the appropriate technical or special terms, facts, equipment, and/or procedures which are part of this discipline and are required for successful completion of the activities listed above.

Cross Reference Footnotes: See The Following Curriculum Objectives:
Lower scale value appears in: 246 247 248 249 250 251 252.
Same scale value appears in: 253 and level 4.

* 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 526.

Type of Objective Knowledge Factor IV No. 268
Skill or Knowledge Category 11738000 Scale Value 2.5
Occupation Patient Care Aide Level 1
Refers to Task Code No(s).: (153) 283 295 521

Is there Cross Reference? ...Yes(X) ...No( ) If yes, see footnote(s).

Content: A graduate of the program at this educational level must be able to demonstrate mastery of the following subject area

Asepsis (concepts and techniques involved in achievement of sterile condition; includes concurrent and terminal disinfection during surgery, aspects of sterilization of implements and equipment such as autoclaving)

at a level of awareness and depth of understanding adequate to the proper performance of the following activities:

1. In using sterile materials to wipe away blood from sterile areas or equipment, change or reinforce dressings, or apply pressure to puncture site, being able to use details about sterile conditions and procedures to achieve or maintain sterile integrity of materials or areas of the body (Tasks 153, 283, 521).

2. In participating in meeting of diagnostic x-ray department nursing staff, being able to comprehend, raise issues, or participate in any discussion dealing with asepsis as it affects patient care (Task 295).

To accomplish these activities the student must have a detailed knowledge of the subject category, covering the appropriate technical or special terms, facts, equipment, and/or procedures which are part of this discipline and are required for successful completion of the activities listed above.

Cross Reference Footnotes: See The Following Curriculum Objectives:
Lower scale value appears in: 265 266 267.
Same scale value appears in: 269 270 271.
Higher scale value appears in: 272 273 274.

CURRICULUM OBJECTIVE SHEET

Type of Objective Knowledge Factor VI No. 279
Skill or Knowledge Category 12210000 Scale Value 2.5
Occupation Quality Assurance Technician Level 2
Refers to Task Code No(s).: 280 529 530 531 532 533 534 535 537 539 540 543 544 548 549 550 556

Is there Cross Reference? ...Yes(X) ...No( ) If yes, see footnote(s).

Content: A graduate of the program at this educational level must be able to demonstrate mastery of the following subject area

Radiobiology (effects of high energy radiation on living organisms; includes effects of ionizing electromagnetic, ultraviolet, sonic, and particulate radiation, biological safety requirements and protection)

at a level of awareness and depth of understanding adequate to the proper performance of the following activities:

1. In participating in monitoring of personal exposure to ionizing radiation, understanding the effects of all ionizing radiation on human tissues sufficiently to conscientiously conform to safety requirements such as wearing gonadal shielding or making exposures behind protective barriers; being able to use details about the effects of exposure on human tissues to conscientiously note when accidental or excessive personal exposure may have occurred (Task 280).

2. In testing x-ray equipment, film processors and x-ray films for conformance to radiation protection standards, conducting radiation protection survey, or calibrating test instruments, understanding the effects of ionizing (x-ray) radiation on human organisms sufficiently to conscientiously apply tests and evaluate conformity with safety requirements; being able to use details about the effects of ionizing (x-ray) radiation on human tissues to discuss results of tests, such as effect of problems and deviations from acceptable standards on patient exposure (each of the tasks listed except Task 280).

To accomplish these activities the student must have a detailed knowledge of the subject category, covering the appropriate technical or special terms, facts, equipment, and/or procedures which are part of this discipline and are required for successful completion of the activities listed above.

Cross Reference Footnotes: See The Following Curriculum Objectives:
Lower scale value appears in: 275 276 277.
Same scale value appears in: 278 280.
Higher scale value appears in: 281 282.

Type of Objective Knowledge Factor IV No. 285
Skill or Knowledge Category 12223000 Scale Value 2.5
Occupation Patient Care Aide Level 1
Refers to Task Code No(s).: 73 74

Is there Cross Reference? ...Yes(X) ...No( ) If yes, see footnote(s).

Content: A graduate of the program at this educational level must be able to demonstrate mastery of the following subject area

Diagnostic Radiography (application of electromagnetic ionizing radiation such as x-rays to achieve interpretable images for diagnostic purposes; also includes fluoroscopy, use of related techniques, contrast media, procedures, positioning, interpretation of images)

at a level of awareness and depth of understanding adequate to the proper performance of the following activities:

1. Using details of diagnostic radiography and general awareness of diagnostic procedures and equipment in order to reassure patient or accompanying family member about the procedures, explain what will happen, explain the equipment or the nature of the examination (Tasks 73, 74).

To accomplish these activities the student must have a detailed knowledge of the subject category, covering the appropriate technical or special terms, facts, equipment, and/or procedures which are part of this discipline and are required for successful completion of the activities listed above.

Cross Reference Footnotes: See The Following Curriculum Objectives:
Lower scale value appears in: 283 284.
Same scale value appears in: 286 287 288 289.
Higher scale value appears in: 290 291 292 293 294.

Type of Objective Knowledge Factor 1 No. 290
Skill or Knowledge Category 12223000 Scale Value 3.5
Occupation Quality Assurance Technician Level 2
Refers to Task Code No(s).: 173 175 529 530 531 532 533 534 535 537 538 539 540 543 544 548 549 550 553 556

Is there Cross Reference? ...Yes(X) ...No( ) If yes, see footnote(s).

Content: A graduate of the program at this educational level must be able to demonstrate mastery of the following subject area

Diagnostic Radiography (application of electromagnetic ionizing radiation such as x-rays to achieve interpretable images for diagnostic purposes; also includes fluoroscopy, use of related techniques, contrast media, procedures, positioning, interpretation of images)

at a level of awareness and depth of understanding adequate to the proper performance of the following activities:

1. Using an understanding of diagnostic radiography and appropriate details about diagnostic x-ray equipment, technical factors, controls, test materials, collimators, and the interpretation of radiographic images to carry out tests of x-ray equipment by setting x-ray tube at appropriate test heights, using light system, collimators, setting technical factors, preparing test films, using test objects, making test exposures, interpreting test images (Task 73, 175, 529, 530, 531, 533, 535, 537, 539, 540, 543, 544).

2. Using an understanding of diagnostic radiography and appropriate details about a variety of diagnostic x-ray equipment, film processors, x-ray film, and special test equipment (such as test top, penetrometer, beam attenuators, test bar or star patterns, pin hole diaphragm, pulse counter, chronometer, oscilloscope, radiation detection device, phantoms, survey meter, kVp, mA, mAs measuring instruments, graph paper, penetrometer test cassettes, ionization chamber, electrometer, filters, sensitometer, radioactive source, TLD packets) to carry out tests of x-ray equipment such as:

accuracy check of x-ray machine timers using spinning top test (Task 173);

penetrometer test of kVp or mA calibration (Task 175);

check of x-ray field limitation, x-ray receptor and light field alignment, minimum TOD, TFD, and field size-indicators (Task 529);

check of fluoroscopic and spot film x-ray field limitation, x-ray field and image receptor alignment, maximum TID, minimum TOD (Task 530);

check of x-ray tube overload protection and effective focal spot size (Task 531);

Type of Objective Knowledge Factor VI No. 290
Skill or Knowledge Cagegory 12223000 Diagnostic Radiography Scale Value 3.5

Content Continued

direct calibration tests of exposure timers (Task 532);

→ check of automatic exposure termination device (Task 533);

visual, radiographic, or fluoroscopic inspection of personnel shielding devices (Task 534);

direct measurement or radiographic check of kVp, mA, mAs calibration, exposure rates, reproducibility (Task 535);

check of operation of tomography equipment, fulcrum position, resolution, exposure uniformity, grid alignment (Task 537);

check of the total filtration of the primary beam (HVL) (Task 538);

check of bucky-grid alignment and centering (Task 539);

check of fluoroscopic automatic brightness control system, the focus, resolution and distortion of the optical system including cine, spot film, and video devices (Task 540);

check of film processors (Task 543);

determination of exposure characteristics of x-ray and dosimetric films (Task 544);

check of fluoroscopic equipment maximum entrance exposure rate, primary barrier transmitted radiation rate (Task 548);

check of leakage radiation rate from source assembly (Task 549);

survey of stray radiation within diagnostic x-ray installation and transmission across primary and secondary protective barriers (Task 550).

3. Being able to use an understanding of diagnostic radiography and appropriate details about equipment functions and test standards to interpret
→ test results by comparing with test standards: being able to select appropriate course of action such as request repair, shut down equipment (Tasks 173, 175, 529, 530, 531, 532, 533, 534, 535, 537, 538, 539, 540, 543, 544, 548, 549, 550).

4. Using an understanding of diagnostic radiography and appropriate details about exposure and calibration of radiation detection to make calibration exposures of dosimetric film or thermoluminescent dosimeters using densitometer or TL reader, carry out procedures to read and record exposure from radiation detection badge inserts (Task 553).

Type of Objective Knowledge Factor VI No. 290
Skill or Knowledge Cagegory 12223000 Diagnostic Radiography Scale Value 3.5

Content Continued

5. Using details about diagnostic radiography and test procedures to carry out calibration of exposure detection instruments such as ionization chamber integrating radiation meter, radiation rate meter, survey meter (Task 556).

To accomplish these activities the student must have a detailed knowledge of the subject category, covering the appropriate technical or special terms, facts, equipment, and/or procedures which are part of this discipline and are required for successful completion of the activities listed above.

Cross Reference Footnotes: See The Following Curriculum Objectives:
Lower scale value appears in: 283 284 285 286 287 288 289.
Same scale value appears in: 291.
Higher scale value appears in: 292 293 294.

CURRICULUM OBJECTIVE SHEET

Type of Objective Knowledge Factor VI No. 330
Skill or Knowledge Category 15222500 Scale Value 1.5
Occupation Quality Assurance Technician Level 2
Refers to Task Code No(s).: 173 175 178 187 280 529 530 531 532 533 534 535 537 538 539 540 543 544 545 548 549 550 556

Is there Cross Reference? ...Yes(X) ...No( ) If yes, see footnote(s).

Content: A graduate of the program at this educational level must be able to demonstrate mastery of the following subejct area

Interaction With Radiation (includes inversion spectra-absorption of microwave radiation)

at a level of awareness and depth of understanding adequate to the proper performance of the following activities:

1. Taking account of details of x-radiation properties such as scattering, the qualities of radiolucent and radiopaque materials, absorption and density properties of matter to carry out tests of x-ray equipment involving exposure of test films, masking of areas of test films, and attention to personal safety (Tasks 173, 175, 178, 187, 529, 530, 531, 533, 534, 535, 537, 538, 539, 540, 544, 545).

2. In participating in monitoring of personal exposure to radiation, understanding details about the properties and behavior of electromagnetic ionizing radiation such as x-rays, gamma rays in interaction with living tissue (transfer of energy from the radiation to molecules of the cells) and with other forms of matter to be able to take account of scattering, the qualities of radiolucent and radiopaque materials, absorption and density qualities of matter to understand the reason for monitoring, how to deal with the detection device, and to be able to determine when excessive personal exposure may have occurred (Task 280).

3. Applying details about the properties and behavior of electromagnetic ionizing radiation such as x-rays in interaction with living tissue (transfer of energy from the radiation to molecules of the cells) and with other forms of matter (such as attenuating material to reduce the exposure rate of a beam of radiation) to be able to use test equipment such as radiation devices appropriately; to understand and explain the effects of deviations from acceptable safety standards for x-ray equipment on patient exposure and the quality of the radiographic image (Tasks 529, 530, 531, 532, 533, 534, 535, 537, 538, 539, 540, 545, 548, 549, 550).

4. Applying details about the properties and behavior of gamma rays in interaction with living tissue and other matter to safely handle a gamma ray source in producing a standard test film exposure or calibrating test instruments (Tasks 543, 556).

Type of Objective Knowledge Factor VI No. 330
Skill or Knowledge Cagegory 15222500 Scale Value 1.5

Content Continued

5. Applying details about x-radiation properties such as scattering, stray radiation, absorption and density to carry out radiation protection survey correctly, determine the safest positions for personnel who must remain in room during exposure, and consider means of reducing personnel or patient exposure (Task 550).

To accomplish these activities the student must have a detailed knowledge of the subject category, covering the appropriate technical or special terms, facts, equipment, and/or procedures which are part of this discipline and are required for successful completion of the activities listed above.

Cross Reference Footnotes: See The Following Curriculum Objectives:
Same scale value appears in: 329 331.
Higher scale value appears in level 5.

CURRICULUM OBJECTIVE SHEET

Type of Objective Knowledge Factor IV No. 342
Skill or Knowledge Category 65620000 Scale Value 1.5
Occupation Patient Care Technician Level 2
Refers to Task Code No(s).: 33 156 (182)

Is there Cross Reference? ...Yes(X) ...No( ) If yes, see footnote(s).

Content: A graduate of the program at this educational level must be able to demonstrate mastery of the following subject area

Mechanics of Writing English (includes traditional (prescriptive) grammar, punctuation, spelling, bibliographic, and footnote form)

at a level of awareness and depth of understanding adequate to the proper performance of the following activities:

1. Applying details of grammar, punctuation, and spelling in recording condition of wound, or writing orders for medication, or recording what was done in connection with removal of patient's sutures, irrigating, cleaning, and/or dressing a wound, or setting up and using a suction machine (Tasks 33, 156, 182).

To accomplish these activities the student must have a detailed knowledge of the subject category, covering the appropriate technical or special terms, facts, equipment, and/or procedures which are part of this discipline and are required for successful completion of the activities listed above.

Cross Reference Footnotes: See The Following Curriculum Objectives:
Same scale value appears in: 343.
Higher scale value appears in: 344 345.

CURRICULUM OBJECTIVE SHEET

Type of Objective Knowledge Factor VI No. 343
Skill or Knowledge Category 65620000 Scale Value 1.5
Occupation Quality Assurance Technician Level 2
Refers to Task Code No(s).: 173 175 178 187 525 529 530 531 532 533 534 535 536 537 538 539 540 543 544 545 548 549 550 556

Is there Cross Reference? ...Yes(X) ...No( ) If yes, see footnote(s).

Content: A graduate of the program at this educational level must be able to demonstrate mastery of the following subject area

Mechanics of Writing English (includes traditional (prescriptive) grammar, punctuation, spelling, bibliographic, and footnote form)

at a level of awareness and depth of understanding adequate to the proper performance of the following activities:

1. Applying details of grammar, punctuation, and spelling in recording results and evaluation of tests of diagnostic x-ray equipment, and recording what was done to correct problems (all tasks listed).

To accomplish these activities the student must have a detailed knowledge of the subject category, covering the appropriate technical or special terms, facts, equipment, and/or procedures which are part of this discipline and are required for successful completion of the activities listed above.

Cross Reference Footnotes: See The Following Curriculum Objectives:
Same scale value appears in: 342.
Higher scale value appears in: 344 345.

Type of Objective Procedural Factor IV No. 346
Skill or Knowledge Category Not Applicable (n.a.) Scale Value n.a.
Occupation Patient Care Aide Level 1
Refers to Task Code No(s).: 30 tasks listed below

Is there Cross Reference? ...Yes( ) ...No(X) If yes, see footnote(s).

Content: A graduate of the program at this educational level must be able to demonstrate the following to a degree of proficiency appropriate to the task situation:

1. Demonstrate the proper sequence of events in each of the tasks listed below (all the tasks for this factor at this level).

2. Properly use all the equipment called for in the tasks below.

To accomplish this, the student must be able to (a) list the proper sequence of events in each task; (b) indicate the possible emergencies or variations to be expected in the task situation, and the proper sequence of events for each eventuality; and (c) demonstrate the proper performance of each task in a predetermined clinical setting or in a clinical simulation.

Task 73 Reassuring any patient and/or accompanying adult about x-ray and/or fluoroscopy procedures.

→ Task 74 Explaining to any out-patient or accompanying adult proper at-home procedures to follow prior to coming for radiographic or fluoroscopic examination.

Task 98 Obtaining a clean catch urine specimen from any patient and preparing for laboratory.

Task 113 Giving any patient general reassurance.

→ Task 138 Reporting observed symptoms and concerns of any patient to physician or staff member.

→ Task 153 Assisting physician or co-worker in special examination or treatment procedures.

Task 155 Obtaining urine specimen on orders.

Task 166 Using isolation and decontamination techniques to prepare examination or treatment room or area and clean up afterwards for patient with infectious or communicable condition.

Task 190 Assisting patient to or from wheelchair, stretcher, bed, or table and/or transporting patient to designated area.

Task 193 Having any patient and materials prepared for special procedure and readying patient for examination.

Type of Objective Procedural Factor IV No. 347
Skill or Knowledge Category Not Applicable (n.a.) Scale Value n.a.
Occupation Patient Care Technician Level 2
Refers to Task Code No(s).: 17 tasks listed below

Is there Cross Reference? ...Yes( ) ...No(X) If yes, see footnote(s).

Content: A graduate of the program at this educational level must be able to demonstrate the following to a degree of proficiency appropriate to the task situation:

1. Demonstrate the proper sequence of events in each of the tasks listed below (all the tasks for this factor at this level).

2. Properly use all the equipment called for in the tasks listed below.

To accomplish this, the student must be able to (a) list the proper sequence of events in each task; (b) indicate the possible emergencies or variations to be expected in the task situation, and the proper sequence of events for each eventuality; and (c) demonstrate the proper performance of each task in a predetermined clinical setting or in a clinical simulation.

Task 18 Drawing blood from any non-pediatric patient's vein on orders.

Task 33 Removing any patient's sutures.

Task 65 Preparing specimens such as extravascular body fluids, washings, cell and/or tissue biopsies for transportation to laboratory.

Task 133 Administering subcutaneous or intramuscular injection for any patient according to MD's orders after having quantity checked.

Task 143 Catheterizing any female urethra as ordered.

Task 156 Irrigating, cleaning, dressing or redressing any patient's wound, burn, or opening for catheter as ordered.

Task 181 Catheterizing any male or female patient's urethra with retention balloon catheter.

→ Task 182 Setting up and using suction machine to clear airway or to assist with gastric lavage.

Task 185 Administering oxygen from portable or piped outlet unit using oronasal or nasal mask according to MD's orders.

Task 198 Administering medication orally to any patient according to MD's orders after having quantity checked.

Task 243 Restraining any patient.

Type of Objective Procedural Factor VI No. 349
Skill or Knowledge Category Not Applicable (n.a.) Scale Value n.a.
Occupation Quality Assurance Technician Level 2
Refers to Task Code No(s).: 32 Tasks listed below

Is there Cross Reference? ...Yes( ) ...No(X) If yes, see footnote(s).

Content: A graduate of the program at this educational level must be able to demonstrate the following to a degree of proficiency appropriate to the task situation:

1. Demonstrate the proper sequence of events in each of the tasks listed below (all the tasks for this factor at this level).

2. Properly use all the equipment called for in the tasks listed below.

3. Properly apply arithmetic in using symbolic skills, algebra, and descriptive statistics.

To accomplish this, the student must be able to (a) list the proper sequence of events in each task; (b) indicate the possible emergencies or variations to be expected in the task situation, and the proper sequence of events for each eventuality; and (c) demonstrate the proper performance of each task in a predetermined clinical setting or in a clinical simulation.

Task 78 Checking and jacketing patient's radiographs, ultrasonograms, and/or C.T.T. scans with requisition sheets and prior diagnostic materials and placing for filing or interpreting.

Task 173 Checking accuracy of x-ray machine timers (except phototimers) with spinning top test.

Task 175 Performing penetrometer calibration test of kVp or mA selectors of x-ray machine output.

Task 178 Checking, preparing fluoroscope controls (and phototimer).

Task 187 Checking cassettes for proper film-screen contact.

Task 276 Making minor adjustments or repair on automatic x-ray film processor.

Task 280 Participating in monitoring of personal exposure to radiation by periodically turning in and replacing film strip in badge worn by performer.

Task 523 Preparing computerized transverse axial tomography (C.T.T.) equipment for use.

Type of Objective Procedure Factor VI No. 349

Skill or Knowledge Cagegory n.a. Scale Value n.a.

Content Continued

Task 524 Providing preventive maintenance for display tube surface, camera, disc and/or tape drive units, and/or scanning assembly (especially water-using head box assembly) of computerized transverse axial tomography (C.T.T.) equipment.

Task 525 Checking calibration and accuracy of C.T.T. equipment by making test scans.

Task 527 Retrieving, displaying and making photographs, printouts and/or magnetic tape records of computerized transverse axial tomographic (C.T.T.) scans.

Task 529 Checking x-ray field limitation, x-ray receptor and light field alignment, minimum TOD, TFD and field size indicators for diagnostic x-ray equipment.

Task 530 Checking fluoroscopic and spot film x-ray field limitation, x-ray field and image receptor alignment, maximum TID, minimum TOD, and other requirements.

Task 531 Testing whether diagnostic x-ray tube overload protection and/or effective focal spot size meet acceptable standards.

Task 532 Checking and/or performing direct calibration tests of diagnostic radiography equipment exposure timers.

→ Task 533 Checking automatic exposure termination of diagnostic radiography equipment.

Task 534 Providing visual and radiographic or fluoroscopic inspection of personnel shielding devices such as leaded gloves, aprons, sheets, gonadal shields.

Task 535 Performing calibration tests of kVp, mA mAs, exposure rates, reproducibility on diagnostic radiography equipment using direct measuring instruments and/or radiographic comparisons.

Task 536 Providing visual and/or manual inspection of diagnostic radiography system.

Task 537 Checking diagnostic tomography x-ray equipment for mechanical operation, fulcrum position, resolution, exposure uniformity and/or grid alignment.

Task 538 Estimating HVL and checking adequacy of filtration of diagnostic x-ray equipment.

END

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